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EDITED BY R. A. BROOMAN.

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"Men, my brothers, men the workers, ever reaping something new:
That which they have done but earnest of the things that they shall do."

TENNYSON.

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1855

INDEX

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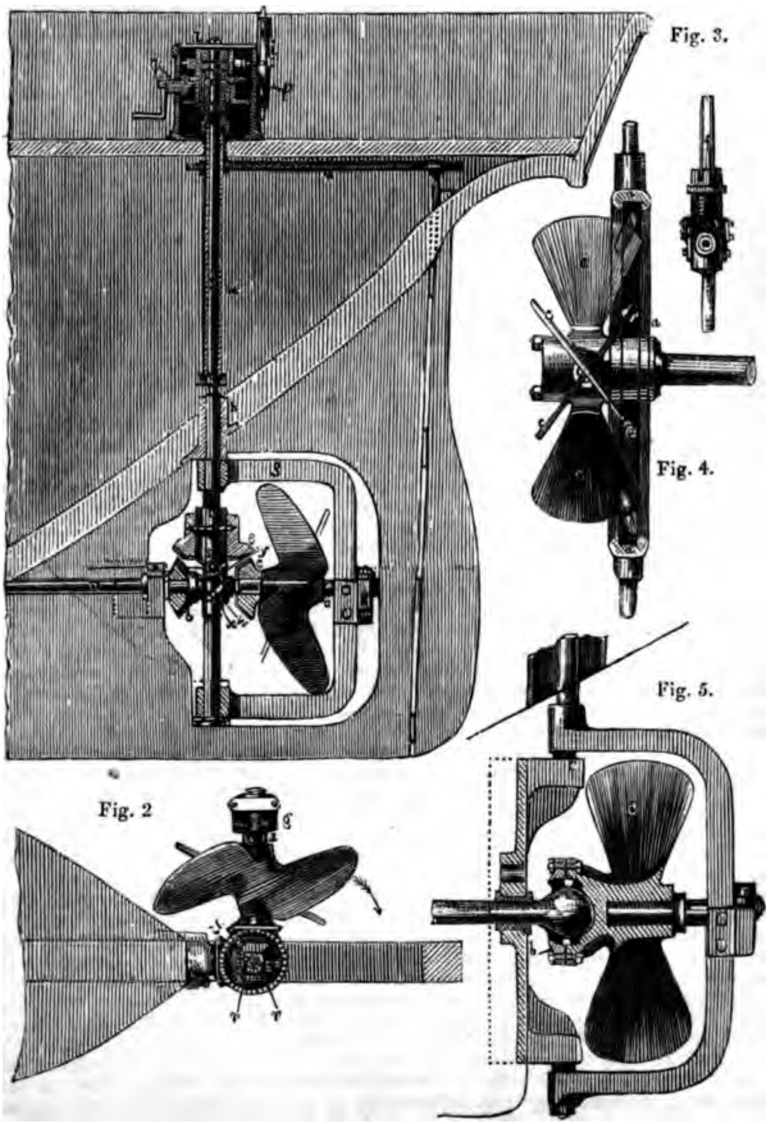
ABADIE'S PATENT SCREW PROPELLING AND STEERING APPARATUS.

Fig. 1.



ABADIE'S PATENT SCREW PROPELLING AND STEERING APPARATUS.

(Patent dated November 13, 1854.)

The arrangement of apparatus represented by the engravings on the preceding page, and described hereafter, has been patented by M. Abadie, of Paris, for the purpose of giving to vessels propelled by screws "such liberty of movement as will allow of their moving in curves of very small radius, so that they may be enabled to perform any required evolutions, and even to turn round within a space equal to their own length."

Fig. 1 is a vertical fore and aft section of a vessel fitted with the improved apparatus, taken through her middle line; *a* is the driving shaft, which revolves in a stuffing box, bolted to the hull of the vessel and provided with packing consisting of leather washers or discs which may be compressed to any required degree by means of screw bolts which tighten up a gland. *b* is a bevil wheel keyed to the extremity of the driving shaft, *a*, which communicates motion to the bevil wheel, *c*, mounted on the screw shaft, *d*, by means of the intermediate bevil wheel, *e*, which is mounted loosely on the vertical shaft, *f*, to which the screw frame, *g*, is affixed. The shaft, *f*, has its lower extremity turning in a step, and is supported in the middle by a collar, *h*, bolted to the timbers of the vessel, and has its upper extremity turning in a bearing bolted to the deck. *i* is a hand wheel, upon the shaft of which is mounted an endless screw, which, by gearing into the screw wheel, *j*, imparts the requisite axial motion to the shaft, *f*. The outer extremity of the screw propeller shaft turns in a bearing, *k*, bolted to the frame, *g*, which frame is attached at its upper and lower extremities by bolts to the shaft, *f*. *l* is an index or pointer for indicating the position which is required to be given to the screw for the purpose of performing the various evolutions. Fig. 2 is a horizontal section, taken about the level of the water line, showing the screw propeller adjusted at an angle to the keel of the vessel. The arrow in this fig. shows the direction in which the screw with its appurtenances is capable of moving from the position shown.

If it be desired to unite the screw shaft to the main shaft in order to relieve the gearing from the wear to which it would be exposed if working continuously, this may be effected in the following manner: *m* is a hollow shaft, which encloses the shaft, *f*, and is connected with the rudder by means of a chain, *n*, taking into the teeth of a pinion keyed on to the hollow shaft, *m*, and also into another pinion on the head of the rudder. At its upper extremity the hollow shaft, *m*, is provided with a shoulder, which rests upon a threaded collar, *o*, so mounted as to be capable of simply ascending or descending without turning. This collar carries a bevil wheel, *p*, and on motion being communicated to this wheel, *p*, by the bevil pinion, *q* (mounted inside the casing), it will raise or lower the collar, *o*, and with it the hollow shaft, *m*. The shaft, *f*, is provided with one or more studs or projections, which are made to enter either longitudinal slots or annular recesses in the hollow shaft, *m*, according to whether that shaft and the other which it encloses are intended to turn together or not. The shaft, *f*, can neither ascend nor descend, and when the hollow shaft is in the position represented at fig. 2, the studs will be in the longitudinal slots, and will connect the hollow shaft, *m*, with the shaft, *f*, which it encloses. When, on the contrary, the shaft, *m*, is raised up, the studs will turn in the annular recesses without producing any effect on the vertical shaft. A feather on the upper end of the shaft, *m*, fits into a vertical slot in the boss of the worm wheel, *j*, which rests upon the wheel, *p*, and is driven by the worm upon the shaft or axle of the steering wheel, *i*, for the purpose of communicating an axial motion to the shaft, *m*. Instead of a single worm, two might for greater strength be adapted, one at each side of the wheel, *j*, the axles of the two worms being geared together to ensure their simultaneous action; and in order to act with greater rapidity, the intermediate wheel, *j*, might be connected with the driving shaft of the engine in such a manner that the required direction might be imparted direct therefrom to the screw propeller; but in this case it would be necessary to employ any of the known means of gearing to permit of instantaneous action. When the screw is not in action the rudder is worked by the wheel, *i*, by means of the hollow shaft, *m*, and its endless chain, *n*, the vertical shaft, *f*, remaining fixed and in its normal position, as seen in fig. 1. The vertical shaft, *f*, has two longitudinal slots cut in its lower part for the reception of two feathers, *r*, fig. 2, which are connected to the hollow shaft, *m*, above by two keys enclosed in the annular recess at the lower part of the said hollow shaft. The feathers, *r*, are connected at their lower part to a collar, *s*, round which the bevil wheel, *e*, revolves, which wheel is composed of two parts bolted together, and holding between them a ring, *t*, which serves to prevent the wheel from slipping off the collar. The object of the feathers, *r*, is to allow of the adjustment to the vertical shaft, *f*, of the screw frame, *g*, and at the same time to allow the motion of the hollow shaft, *m*, to be transmitted to the collar, *s*. It will now be understood that the wheel, *e*, being connected by the feathers, *r*, to the hollow shaft, *m*, it is only necessary to raise this latter

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to disengage the wheel, *e*, from the wheels, *b* and *c*, into which it gears, to prevent the action of the driving shaft upon the screw. It is, however, necessary when the propeller is required to be employed, to connect the screw shaft, *d*, with the driving shaft, *a*, in order that the rotation of the latter may be transmitted directly to the screw. This is effected in the following manner:—The shaft, *f*, has at its lower part an enlargement, *u*, having an opening cut through it for the passage of the collar, *v*, (fig. 3), and screw shaft, *d*. The collar, *v*, has a groove cut in it for the reception of a ring, *w*, having an opening of an oval form, and which is connected by two links, *x* and *y*, on one side to the enlargement, *u*, and on the other to the collar, *s*. When the collar, *s*, rises it tends to straighten the two links vertically, which will thereby bring the ring, *w*, and consequently the collar, *u*, near to the projecting rod or clutch of the wheel, *l*; the ring, *w*, in consequence of its oval form, will facilitate this movement by rising, as the link, *x*, being attached to the enlargement, *u*, cannot move in that direction; the ring will therefore rise, and cause the collar to slide towards the clutch. By this means the movement of the wheel, *p*, worked by the winch handle on the axle of the pinion, *q*, will, through the hollow shaft, *m*, and the feathers, *r*, raise the collar, *s*, and carry the wheel, *e*, out of gear with the wheels, *b* and *c*; and at the same time, by means of the links, *x* and *y*, and the ring, *w*, the collar or clutch will be carried forward and brought into connection with the driving shaft, *a*, the bevil wheels being by this means thrown out of gear. It will be understood that this arrangement is only useful when the gearing is not employed; but as there is no disadvantage attending the employment of the latter, this connecting and disconnecting apparatus may be dispensed with, and the screw rendered independent of the driving shaft by any suitable means.

If it be not desired to employ the propeller (as the screw, if connected with the driving shaft, would offer too great a resistance to the progress of the vessel), the hollow shaft, *m*, must be raised sufficiently, merely to ungear the intermediate wheel, *e*, without connecting the collar or clutch with the driving shaft; by this means the screw will be set free to turn loosely. In order again to bring the wheels into gear, the winch handle on the axle of the pinion, *q*, is to be turned, so as to lower the hollow shaft, *m*; the clutch will then be withdrawn by means of the links, *x* and *y*, and the wheel, *e*, coming again into gear with the wheels, *b* and *c*, the apparatus will be in a position for performing any evolution required. Care must be taken to reverse the motion of the engine when the gearing or ungearing operation is performed, as the bevil gearing reverses the direction of rotation imparted to the driving shaft.

"Fig. 4," says the inventor, "represents in vertical section a modification by which the bevil gearing may be dispensed with. *a* is a ring having an annular groove formed in its inner face for the reception of pins, *b b*, projecting from the ends of the propeller blades, *c c*, which are connected in pairs, and set in a contrary direction to each other, the shafts which unite them being bent, in order to allow of their passing over each other in the centre, inside a hollow boss, formed of two parts bolted together. This arrangement allows of the two pairs of blades oscillating one upon the other within the same centre of motion. In this arrangement the ring governs the position or pitch of the screw blades, as, by causing it to advance or retire, the blades are caused to turn on their pivots, and assume a greater or less degree of inclination, and thus alter the pitch of the screw. In order to cause the vessel to swing round, or to steer it in any required direction, the ring is turned in one direction or the other; the inclination of the ring will alter the position of the blades, which being adapted to the centre in pairs, one extremity of each pair will be presented edgewise to the action of the water, and will consequently produce no effect thereon; whilst the other extremity will act with its whole surface, and will thus impart motion to the vessel in one direction or the other, according to the direction of rotation communicated to the driving shaft, or the position of the blades produced by the ring, the vessel being by this means caused to turn round." The ring, *a*, is mounted in guides which allow of its being moved backwards or forwards, in order to alter the pitch of the screw, and to it are connected four rods, which are capable of being moved, either altogether, in order to move the ring backwards or forwards, or two of them in one direction and the other two in the other, in order to vary its inclination either horizontally or vertically. As the best position for the ring under different circumstances can only be determined by experience, screws or levers in connection with these rods are employed to move them.

Another arrangement for doing away with the bevil gearing is represented in sectional elevation at fig. 5. *a* is the driving shaft which terminates in a ball at its outer extremity. This ball fits into a socket formed in the propeller boss, and it is provided with two small pins, *b b*, which work in slots formed in the socket. The rotary motion of the shaft, *a*, is transmitted to the boss of the screw by means of the resistance offered by the pins, *b b*, and when it is desired to turn the frame carrying the screw, this frame is acted on by means

of the vertical shaft, which terminates at the point, *c*, and turns in a step in a bracket attached to the stern post of the vessel. The upper part of the propeller frame is rigidly attached to the vertical shaft, as in the first instance, and its lower part rests in a step below. The shaft, *a*, being set in motion, the screw is caused to turn with it by means of the pins, *b*, on its spherical extremity, but as these pins are capable of playing longitudinally in the socket of the boss, they will, in consequence of the spherical form of the ball, allow of the boss, together with the screw frame, being set at any required angle, either to the right or left without interfering with the rotary motion of the shaft. It will be seen that in this arrangement the screw is connected directly to the driving shaft by means of the ball and socket joint. A clutch arrangement may be provided inside the vessel for allowing the steersman or engineer to throw the screw out of gear with the driving shaft.

PLATING METALS WITH TIN, NICKEL, AND ALUMINA.

A patent has recently been obtained in this country by Mr. Thomas, of Fulham, and Mr. Tilley, of Holborn, for an improved process for plating or coating lead, iron, or other metals with tin, nickel, or alumina, of which the following is the specification.

"The first part of our process," say the inventors, "consists in a mode of preparing a solution of the metal with which the articles are to be coated or plated, for which purpose we proceed as follows:—For tin we dissolve metallic tin by nitro-muriatic acid, and then precipitate the tin by an alkali or alkaline salt, preferably by the terro-cyanide of potassium; we then mix sulphuric acid or muriatic acid with the precipitated oxide of tin, to which we add a portion of water; these we boil in an iron vessel with a small portion of ferro-cyanide of potassium, then filter the liquor and the solution is completed.

"Another mode of forming a solution of tin is as follows:—Having precipitated the oxide of tin, as above described, we add ferro-cyanide of potassium to the oxide and boil them; then set the solution aside to cool and then filter the same; we then pass a stream of sulphuric acid gas through the solution.

"For nickel, we dissolve nickel by nitro-muriatic acid, and precipitate the oxide by ferro-cyanide of potassium; we then wash the oxide and add thereto cyanide of potassium dissolved in distilled water; then boil the mixture, and when cool filter the same, which completes the solution of nickel.

"For alumina, we dissolve alum in water and add ammonia until it ceases to precipitate any more; we then wash the alumina, filter it, add thereto distilled water; boil the same with cyanide of potassium, filter when cold, and the solution of alumina is ready.

"Having thus obtained either of the foregoing solutions, the articles to be covered or plated are suspended by copper or brass rods in a bath of the required solution and attached to the zinc pole of a battery, to the positive pole of which is attached, in the case of a tin bath, a piece of platinum, or a pole of tin in the case of a nickel bath, a bag containing oxide of nickel, or a pole of nickel, and in the case of a bath of alumina, a bag of alumina, or a pole of alumina, or a piece of platinum."

RUSSIAN INFERNAL MACHINES IN THE BALTIC.

THE following account of these machines is taken from a communication of the correspondent of the *Times*, who accompanies the Baltic Fleet.

June 20th.—The infernal machines, which were last year looked upon as myths, have turned out to be realities, sown over almost every yard of ground over which the first division of the fleet is anchored. Two struck the *Merlin* and one the *Firefly* when we were here last time, and one exploded under the *Vulture* to-day, just as she was anchoring, and another as she was swinging to her cable. The first was rather a severe shock, smashing everything in the galley, and throwing the 68 lb. shot out of their racks, but doing no further damage.

21st.—This morning each ship commenced sweeping for the infernal machines, and before night gathered in a capital harvest of them. The way in which the sweeping is done is this:—Two boats take between them a long rope, which is sunk to the depth of 10 or 12 feet by means of weights, and held suspended at that depth by lines attached to small casks, which float on the surface at intervals of 40 or 50 yards; the boats then separate as far as the rope will allow them, and pull in parallel lines until one of the casks stops behind, which tells them, as a fishing float tells the angler, that they have caught something; the two boats then approach each other, keeping the rope taut, then haul it in carefully, and up comes the machine. The *Exmouth* found

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the first, the *Nile* the second, and then the catching became so numerous that in some instances two at a time were hauled up; they were at first supposed to be only the buoys to the machine, but I am sorry to say Admiral Seymour proved them to be the machine itself in a most unpleasant manner. He was examining one on the poop of the *Exmouth*, and incautiously tapped a little bit of iron which projected from its side, saying, "This must be the way they are exploded," when, bang! the thing went off, and everybody round was scattered on the deck, and more or less burnt. Each machine consists of a cone of galvanized iron, 16 inches in diameter at the base and 20 inches from base to apex, and is divided into three chambers; the one near the base being largest, and containing air, causes it to float with the base uppermost. In the centre of this chamber is another, which holds a tube with a fuse in it, and an apparatus for firing it. This consists of two little iron rods, which move in guides, and are kept projected over the side of the base by springs, which press them outwards. When anything pushes either of these rods inwards it strikes against a lever, which moves like a pendulum, in the fuse-tube, and the lower end of the lever breaks or bends a small leaden tube, containing a combustible compound, which is set on fire by coming in contact with some sulphuric acid held in a capillary tube, which is broken at the same time, and so fires the fuse, which communicates with the powder contained in the chamber at the apex of the cone, and which holds about 9lbs. or 10lbs. At the extreme apex is a brass ring, to which is attached a rope and some pieces of granite, which moors them about nine or ten feet below the surface, so that the only vessels they could hurt, the gunboats, float quietly over them, and, now we know what they are, they have been disarmed of all their dread. But they prove dangerous playthings; the Commander-in-Chief was examining one of the fuse-tubes that was supposed to be spoilt, for it was full of mud and water, when he accidentally touched the lever, and it exploded in his hands, scattering the mud into the faces of all present, and literally throwing dirt into their eyes, but doing no hurt.

CAPTAIN ERICSSON ON THE CALORIC ENGINE.

In consequence of the substitution of a steam engine in the place of a caloric engine, in the *Ericsson*, having been freely commented upon by the American press, Captain Ericsson has published the following letter in the New York *Daily Times*.

New York, Thursday, May 24, 1855.

Sir,—The assertions of my opponents that the caloric engine has failed and been abandoned, and that a "new steam engine" has been put into the *Ericsson*, are wholly unfounded.

Every trial made has proved the soundness of the *principle* of the caloric engine, an extraordinary saving of fuel being in every instance well established. I have deemed it prudent, however, not to publish certain facts conclusive as to ultimate success, because it would have encouraged many to help me to "improve," and deprive me, if possible, of the fruits of much labour and expense.

The first engine of the caloric ship was removed, notwithstanding its economy, because it proved too cumbrous for the amount of *available* power it exerted—in other words, because the differential force of the working and supply piston did not prove in practise to realize what calculation promised—losses by leaks, friction, &c., being much greater than reasoning could anticipate. The second engine was applied to remedy this deficiency of power, by employing compressed air, but it was found that the joints of the pipes of the heaters could not be made sufciently tight to carry more than one-third of the intended requisite pressure. Accordingly, this modified engine proved inadequate to give a speed of more than seven miles an hour to the ship. Apart from the imperfections connected with the leaks alluded to, the machine worked to the admiration of all who witnessed its operation. But although *air* thus escaped through the joints, steam, it was found, could only be retained in the heater pipes, and was therefore employed in a surcharged state, in place of air. It was under the agency of surcharged or overheated steam that the machinery operated on the day of the sad accident of sinking the ship. The sudden immersion and cooling of the furnace, pipes, &c., unfortunately destroyed a vital part of the contrivance, and after fruitless attempts to repair and patch, no alternative was left but to apply ordinary boilers. The *engines*, however, are now without alteration; the same as when compressed air was employed. The statement that "new steam engines," planned and constructed for the purpose, have just been put into the ship, is pure fiction. I promised the owners of the ship, on proposing to remove the original caloric engine, to build the second one in such a manner, that if we failed in using air, steam might be resorted to by replacing the air heaters by steam boilers.

The stories relative to the "burning of the bottoms" of the original caloric engine I have deemed it unnecessary to notice, as

many practical means obviously might have been adopted to overcome the difficulty. Numerous have been the suggestions I have received from correspondents in various countries, all proving that I am not alone in thinking that the "incurable burning of the bottoms" was, after all, no serious matter.

The positive assertion, that I have altogether abandoned the caloric engine, is a base calumny. The subject has been by me unceasingly prosecuted. Experiment has succeeded experiment, and continued exertions have been made to devise and perfect the useful mechanical expedients for rendering the incontrovertible physical laws involved in the principle of this machine subservient in producing a cheap and harmless motor. How far I have succeeded in the final practical solution of the great problem will soon become known, as I am now engaged in building a test engine of considerable magnitude.

Possibly the performance of this test engine will prove the conductors of certain scientific publications more at fault in their opinion of the caloric engine than Sir Humphrey Davy was when he ventured to ridicule the proposition of lighting London by gas.

Let me add, that should some unexpected difficulty prevent a full realization of the capability of the new system when the said test engine shall be put in operation, such an event will by no means stop the prosecution of the matter—nor will any mechanical difficulty whatever cause the writer ever to abandon a plan so eminently based on physical truth, and fraught with such vast beneficial results when perfected. It is much to be regretted that so important a matter should be in any manner retarded by the obtrusive interference of persons who do not possess knowledge enough to understand that our present motor, the steam engine, working as it does within a very limited range of temperature, and constantly wasting the caloric, never can be made an economical medium of transferring the force of caloric for motive purposes. Happily, whilst those who only pretend to science thus assail the good cause, the highest authorities support it. The late British Association in England discussed the matter at length, the inferiority of steam as a motor being fully established. The celebrated Regnault—the greatest living authority in relation to caloric—in a memoir to the French Academy, after discussing the relations of force produced and range of temperature, says: "But, as in the Ericsson system, the heat which the air gives out is given up to bodies, from which the entering *air takes* it again and brings it back to the machine, we see that theoretically *all the heat expended is utilized* for mechanical work; whilst in the best steam engine the heat *utilized in mechanical* work is not the one-twentieth part of the *heat expended*." Endorsed by such authority, and fortified by such opinions, the writer disregards assailants, and will continue to labour at the perfection of the caloric engine until the end is achieved.

I am, Sir, very respectfully, your obedient servant,

J. Ericsson.

To Lieut. Gov. H. J. Raymond.

MAGNETIC CAUSATION.

To the Editor of the Mechanics' Magazine.

Sir,—It is several years since I had the honour of handing you an article upon this subject. In my last I intimated some future communication, which, after this long time, I beg to hand you, and remain,

Your most obedient servant,

George Fowler.

London, July 2, 1855.

Modern philosophy has established the near relationship which exists between electricity and magnetism, amounting almost to identity.

Although electricity is not magnetism, nevertheless, magnetism is electricity, under some modification. Both magnetism and electricity are induced by friction. Magnetism is induced by electricity, and electricity and friction, whilst they generate electricity in ordinary bodies, induce magnetism in iron. From this it follows that what is electricity in ordinary bodies becomes magnetism exclusively in iron, *and also that iron, in some way or other, exerts an influence over or upon electricity, which converts it into magnetism.*

The most important difference to be observed in the investigation of this subject,—between magnetism and electricity,—is that of the duration or permanency of magnetism. Iron retains magnetism for numbers of years; whereas all bodies lose or part with their electricity soon after the exciting cause is removed. It is this retention on the part of iron, of electricity when once excited in it, which invests it with the power known as magnetism.

This is proved by electricity exhibiting the magnetical power in substances in general, whilst the excitation is carried on. All bodies would be magnetic if they perpetuated or carried on a permanent current of electricity around them, the same as is described in iron bars by the magnetic curves.

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The solution of this long-pending problem now resolves itself into very small dimensions, and may be said to lie in a nutshell.

Let us ask what power or property does iron possess exclusively, which is not participated in by bodies in general, and which enables it to perpetuate a circuit of electricity around itself *per se*; or, in other words, to carry on a *perpetual motion*?

Has not iron a greater affinity for electricity than any other substance, and is it not a powerful conductor of electricity, more so than any other body we know of?

The experimental facts before us may be summed up as follows:

First. Electricity is excited in iron by friction.

Second. Iron conducts electric fluid.

Third. Iron has a strong affinity or attractive power for electricity.

Fourth. That the electric fluid, when excited in a bar of iron, enters at one extremity and its contiguous parts, and issues from the other and its contiguous parts. The greatest quantity both entering into and leaving the bar at its poles, and diminishing in quantity as you approach the centre or neutral point, where fluid neither enters nor issues.

Fifth. That the fluid which leaves one pole of the bar and its contiguous surfaces describes curves round the bar, and re-enters at the opposite pole and contiguous surface.

Sixth. That it is then conducted through the bar and evolved at the other extremity, to return again by the external curves.

With these materials the following hypothesis may be framed:

1. Magnetism is due to the affinity of iron for electricity, whereby electric fluid, when excited in and evolved from one extremity of a short bar of iron, becomes immediately attracted by the affinity of the iron at the other, and is drawn over by it.

2. The electric fluid, in passing from one pole and its neighbouring surface to the other, describes the curves which are so well known to magneticians and others, seen on all sides of the bar, and on re-entering it the fluid is conducted through it, evolved from it at the negative, and attracted again by the positive pole, and so on *ad infinitum.*

3. If electricity be evolved from one pole, the affinity of the iron at the other draws it away from it; so that as long as iron has an affinity for electric fluid, so long will it absorb it; and as long as it absorbs the fluid, so long also will it conduct it; and as long as it conducts, so long will electric fluid continue to be evolved from this pole.

4. Then at one pole of the magnet there will be a constant discharge of electricity, and at the other *the presence of a permanent attractive agent*, which constantly withdraws it again.

5. The iron is an active conducting agent, and conveys the fluid which exists about its surface through its interstices, and then discharges it at its extreme points.

6. Thus the internal current which passes through the pores of the iron produces and reproduces the external curves, and the external curves produce and reproduce the internal current, both reciprocating, and being the cause and effect of each other.

7. And thus a natural, mechanical, and permanent current of electricity is carried on by iron *per se*, independent of any quality or property of matter, or the supposed influence of the earth's magnetism, to and by which all magnetic phenomena are referable and explicable.

I will briefly allude to the manner in which the attraction and repulsion take place.

Magnetic attraction is the consequence of the *confluxion* of two or more rotating atmospheres; the atmosphere of one magnet flowing into that of the other, and forming one circuit instead of two or more. The same is the case with soft iron or steel filings, as they become *magnetized* before they are *attracted* by the magnet. It will thus be seen why magnets are incapable of attracting indifferent bodies. The fluid passes through all known substances, which is proved by iron being attracted through them, and they are unaffected. Magnetic attraction does not result from the force the fluid either enters or issues from the body with, but from the aggregate influence of one atmosphere upon the other, each of which in magnets four or five inches long will extend from three to five inches on all sides of the bar.

Repulsion results from the *opposition* of two or more rotating atmospheres, which takes place on the approach of two positive or two negative poles. In either case the fluid rotates in opposite directions, and the *pressure* thus engendered causes them to repel each other; whereas in attraction the fluid which leaves one magnet enters into the other, and the *resistance being decreased* between them causes them to adhere.

Having, I fear, exceeded the limits of your valuable publication, I must on some future occasion speak on other branches of the subject.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

Sir,—In your number of this day, page 612, under the head of "The Smoke Question," you have given an abstract of the

"Conclusions deduced from the Evidence obtained by the General Board of Health," and now printed by order of Parliament. As these "conclusions" contain not only many useful remarks, but also many inaccuracies and errors, by which the public may be led astray, I propose submitting, through your columns, some observations on each, and by which they will become more intelligible, and at the same time remove those misapprehensions which have, no doubt inadvertently, been introduced.

Conclusion 1. "That the emission of smoke is the effect, and may be taken as the proof of *imperfect combustion*, and is therefore always attended with waste of fuel."

This conclusion is too general to be practically useful. It leaves the main question untouched, and the main issue undecided, namely, What is imperfect combustion, and what is the combustible that is *imperfectly consumed?* Until these are determined, the means of counteracting this imperfection must be equally undetermined. Now, imperfect combustion has not reference to the coal employed, but to the gaseous portion of it, generated in the furnace, and arises from two causes, first, the allowing a portion of the carbon of the gas to pass away, unburnt, by allowing it to be reduced in temperature below that required for its ignition, and before it had obtained atomic contact with the oxygen of the air; secondly, from another portion of the carbon being allowed to pass away, unconsumed, in the form of invisible carbonic oxide. The remedy in both cases lies in bringing the air, either to the carbon or the oxide, not in a body, but in such a *divided form* as to enable it instantaneously to effect the required mixture, and atomic contact, which is the *sine qua non* of subsequent combustion.

Conclusion 2. "That the fuel wasted is not only the visible smoke, which is *unburnt carbon*, but generally a far larger portion in the form of gas, both common coal gas and that called carbonic oxide, which is only *half-burnt carbon*, and which therefore has not produced the heat which it would have generated if it had been perfectly consumed."

This is incorrect in several respects. Visible smoke is not "*unburnt carbon.*" Smoke is a compound of large cloud-like volumes of carbonic acid, nitrogen, and steam (the latter from the combustion of the hydrogen [illegible] the gas). With these three are mixed [illegible] or less of unburnt carbon, but relatively in such a small proportion that although it gives the cloudy volumes their blackened colour, is nevertheless, comparatively, so insignificant in weight or value, as to be, commercially, unworthy of notice as a combustible, were it possible, which it is not, to effect its combustion, diffused as it necessarily must be in those cloudy masses.

Again—carbonic oxide is not "half-burnt carbon." There is, in fact, no such thing as half-burnt carbon. An atom of carbon must be either burnt or unburnt. Carbonic oxide is a distinct, well-defined gas. It is formed in the furnace, not from the coal, but from the coke portion of the coal, when in an incandescent state. Carbonic acid, formed from one portion of such incandescent, or red-hot fuel passing up through the portion above it, takes up an additional equivalent of carbon. Thus, one volume of carbonic acid is formed into two volumes of carbonic oxide. Its combustion, when the air is admitted, is easily distinguished in the furnace by its semi-transparent bluish colour, and may be perceived in the fire-box of the locomotive when the door is opened.

Conclusion 3. "That the chief impediment to the prevention of smoke in manufactories is the *insufficient boiler surface* in proportion to the steam required; a deficiency which causes waste in two ways; first, because much of the heat produced escapes up the chimney uselessly, and next because this deficiency has to be made up by *over-firing*, whence imperfect combustion and consequent waste of fuel."

This conclusion is erroneous and misleading. The prevention of smoke has no relation to the "insufficient boiler surface." This is shown by the fact that smoke is formed in the same way and to the same extent where there is neither boiler nor boiler surface; as in many furnaces used in manufactories; for instance, in the charcoal-heating furnaces of the sugar refiners, or those used for heating the iron plates of boiler makers and iron ship builders. The generation of heat in the furnace and the generation of steam in the boiler are distinct processes, and the confounding the one with the other is a serious mistake, and tends to lead boiler makers and engineers astray. What is called "*over-firing*" is but effecting a more rapid combustion, as when we stir the fuel in a house grate. If the fuel be more rapidly consumed in the furnace, there must necessarily be more gas generated in equal time, and, of course, more air is required for such increased

[redacted]

quantity of gas. It is the overlooking of the necessity for this increased quantity of air which leads engineers into this error.

Conclusion 4. "The employers of furnaces labour under great difficulty as to the best and most economical use of fuel, because ordinary makers of furnaces seem to be guided in their construction by little better than empirical rules, instead of acting upon well-established scientific principles, or the results of accurate experiments."

This conclusion is too well founded to require any comment.

Conclusion 5. "That notwithstanding this great difficulty, many persons have succeeded in entirely preventing the escape [formation] of visible smoke, except while first lighting their furnaces, and many others have reduced the time during which smoke is emitted to a fraction of its former amount."

This is also unquestionably true.

Conclusion 6. "That experience has fully proved that there is no truth in the common allegation, that if smoke be prevented, there must be increased difficulty in getting up and maintaining steam."

This is also true, provided the combustion in the furnace and the prevention of the formation of smoke be properly effected by the introduction of the *required quantity* of air, in the *proper manner*. If however, the air be injudiciously introduced, though smoke may be prevented, nevertheless there may be "increased difficulty in getting and maintaining steam."

As time presses, and I could not complete my remarks within such space as your columns would permit, I shall defer the examination of the remaining "conclusions" until next week.

I am, Sir, yours, &c.,

C. W. WILLIAMS.

Liverpool, June 30, 1855.

MELLISH'S PATENT OBLIQUELY PERFORATED GLASS VENTILATORS.

(Patent dated May 7, 1851.)

To the Editor of the Mechanics' Magazine.

SIR,—It is a somewhat remarkable circumstance, that almost everybody professes to be thoroughly conversant with the "common sense" science of ventilation, and yet very few persons are agreed upon the practical details of the subject, each one entertaining some very peculiar notions on this head. Some parties advocate the employment of Dr. Arnott's valve, heated funnels, and other complicated contrivances for expediting the escape of vitiated air, but render all such arrangements utterly useless, by not providing for the admission of fresh air to replace that which they are so anxious to get rid of. Others, on the contrary, provide exclusively for the admission of fresh air, leaving the vitiated atmosphere to shift for itself, and escape as it may (or may not) be able, in some mysterious manner.

In many apartments the ordinary fireplace would carry off the contaminated atmosphere, if fresh air could enter in corresponding quantities to supply its place; but no provision being made for that purpose, the chimney smokes, and a door or a window must be partially opened, giving rise to unpleasant and unwholesome draughts.

"Ventilation, to be healthy," says a recent writer, "must be imperceptible: the moment it becomes perceptible it is dangerous;" a principle long since enunciated in the well-known distich—

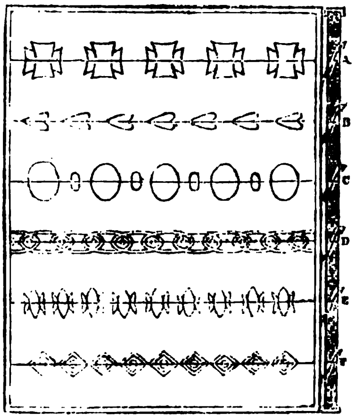
> "When wind blows on you through a hole,
> Make your will, and mind your soul."

That ventilating apparatus is unquestionably the most useful which is capable of adapting itself to both the entrance and exit of air, according to the requirements of the apartment; but most of these are open to the objection that they admit the air so direct, and in such large masses, as to be productive of much inconvenience, and some danger.

To obtain "air without draughts," is the desideratum; and of all the practitioners in this line, none have been so successful as Mr. Mellish, whose "Obliquely Perforated Glass Ventilators" are the very perfection of healthy and efficient ventilation. Guided by a keen perception of what is needful, Mr. Mellish has introduced some further improvements in his perforated ventilators of a novel and eminently beneficial character. The original form of these ventilators was described at page 445 of your 60th volume; as now improved, they effectually supply fresh air in any required quantity without draughts, the currents being so broken up and divided as to enter the room in a continuous but imperceptible manner; besides which, any entering current of air is necessarily deflected upward towards the ceiling,

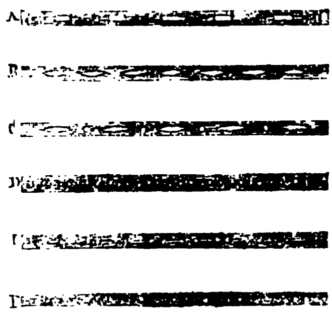
where, mixing with the warmest strata of air, it is gradually diffused throughout the apartment. The manner in which this desirable result is obtained will, I trust, be made intelligible by aid of the accompanying drawings. Fig. 1 is a front view of a patent perforated window pane, the openings in which are not however visible. Fig.

Fig. 1. Fig. 3.



2 is a plan view of the perforations; and fig. 3 an edge section of the pane, showing the form of the openings, and the upward direction of the entering currents of air. This beautiful arrangement is produced by

Fig. 2.



simply cutting* any approved pattern on the opposite sides (upper and lower edges) of a series of strips of glass, which being brought together form a window-pane, impervious alike to rain or direct currents of air. The elegant appearances capable of being produced by the great variety of changes that can be made in the colours and patterns is almost inexhaustible. The designs shown in fig. 1 are but a few of those already in use: the room in which I am now writing is furnished with a ventilator of the pattern D, the cutting of the pattern showing white upon a rich blue ground. The three first patterns, marked A, B and C, are well adapted for public buildings, shops, smoking-rooms, &c., while the patterns, D, E and F, are suitable for sitting-rooms or bed-rooms, and for the latter purpose are strongly recommended by several of the faculty. In the pattern, B, the entering currents of air are deflected sideways, as well as upward, at an angle corresponding to the inclination of the heart-shaped pattern of the cuts.

In these ventilators, although the wind "blows through a hole," it cannot possibly blow "upon you," unless you are in an unusually elevated position, or the ventilator is (as we frequently find them, by the bye), sadly misplaced.

In close chambers, heated shops, or where moist vapours are present, Mellish's perforated ventilators are invaluable.

I remain, Sir, yours, &c.,

William Baddeley.

13, Angell-terrace, Islington,
June 19, 1855.

* By means of "a number of circular mills or cutters fixed on an axis, and caused to rotate, and in their rotation to bring up water and grit." An arrangement since patented by Mr. Hartley; vide abstract of his specification at p. 569 of your 1662nd number.—W. B.

ON STEAM USED EXPANSIVELY.*

To the Editor of the Mechanics' Magazine.

Sir,—In a notice contained in your Magazine, in April last, of a lecture delivered by Mr. Fairbairn, it is said to have been demonstrated by him that, in using steam at a pressure of 40 lbs. on the square inch, and expanding to six volumes, the same fuel would produce three times the work that can be realized from the ordinary condensing engine, using steam at nearly a constant pressure of 10 lbs. As condensing engines generally use steam at a pressure of 10 lbs. above the atmosphere, I presume 40 lbs. above the atmosphere is also meant, and the absolute pressure will then be 25 lbs. and 55 lbs. per square inch respectively, and corresponding temperatures 240° and 286°.

With the view of testing the accuracy of

* We insert this letter, notwithstanding its defectiveness in some respects, in order that the subject it discusses, upon which much ignorance and doubt prevail, may be brought under the consideration of our readers.—Ed. M. M.

[redacted]

this statement, I purpose taking a pound weight of steam under the different circumstances, and calculating the load raised by each; and, although 1 lb. weight of steam, at a pressure of 55 lbs., will require for its production as much heat as would raise in temperature 14 lbs. of water 1° more than that required for the same weight of steam at a pressure of 25 lbs., this will in the meantime be neglected. I will also assume, as generally calculated, that saturated steam —that is, steam at the full pressure due to its temperature—has always the same relative density (·623) as compared to a like volume of air at like temperatures and pressures (this has never been determined, and there is much reason to believe is far from the truth). Now 1 lb. of air at a pressure of 1 atmosphere (say 14·7 lbs.), and temperature of 212°, will measure 29176 cubic inches, and the product of this volume and pressure will equal $29176 \times \frac{14{\cdot}7}{12} = 35740$ ft. pounds; that is to say, would raise 35740 lbs. 1 foot high: and, supposing saturated steam to have the same relative density to air as superheated steam isolated from water (·623), 1 lb. weight, at 212°, would measure $29176 \times \frac{1000}{623} = 46831$ cubic inches, or fully 27·1 cubic feet; and the product of the volume and pressure would equal

$$46831 \times \frac{14{\cdot}7}{12} = 57368 \text{ foot pounds};$$

or this may also be found by taking the product of the volume and pressure of 1 lb. of air at the given temperatures, and dividing by ·628, thus, $35740 \div 623 = 57367$ foot lbs. Then air and all perfect gases expand $\frac{1}{672}$ part of the volume at this temperature for each degree added; and, assuming steam to expand in the same ratio, in raising the temperature 28°—that is, from 212° to 240°—$\frac{28}{672}$ parts would be added to the product of the volume and pressure, which would equal 2390 foot pounds, as $57368 \times \frac{28}{672} = 2390$; but it will be sufficiently accurate to say, that each degree of rise in temperature increases the product of the volume and pressure of 1 lb. weight of steam by 85·3 foot pounds; so that when the temperature is raised 28°, this product will be increased by $28 \times 85{\cdot}3 = 2388$ foot pounds; and the total load raised by 1 lb. of steam at a temperature of 240°, including all resistances, will equal $57368 + 2388 = 59756$ foot lbs.; and at a pressure of 55 lbs., which corresponds to a temperature of 286°, or a rise of $286 - 212 = 74°$, the product of the volume and pressure would equal $85{\cdot}3 \times 74 = 6312 + 57368 = 63680$ foot pounds; that is to say, while 59756 lbs., raised 1 foot, would be the gross load, including all resistances, overcome by 1 lb. of steam at a temperature of 240°, without being used expansively, the same weight of steam, at a temperature of 286°, would raise 63680 lbs.; and if the latter is expanded to six volumes, at a constant temperature of 286°, the hyperbolic logarithm of 6 being 1·7917, the gross load raised would equal $63680 \times 2{\cdot}7917 = 177775$ foot pounds, which is nearly three times the load (59756) raised by 1 lb. of steam without expansion, at a temperature of 240°; but to realize this, in the first place, the steam must expand without being permitted to fall in temperature, and to maintain 1 lb. of steam at a constant temperature of 286°, while expanding to six volumes would require, if this load is raised, as much additional heat as would raise in temperature at least 148 lbs. of water 1°; and in the next place, the loss in both cases, from imperfection of vacuum, requires to be considered, as the loss from this cause increases with the rate of expansion.

I will, then, suppose that the vacuum equals 13·7 lbs., which will correspond to a pressure of vapour in the condenser of 1 lb. on the square inch, and temperature of 104°; then the pressure of steam in the cylinder, at the end of the stroke, after expanding from 55 lbs. at a constant temperature to six volumes, will be fully 9 lbs., and when a communication is made with the condenser, 8-9ths of the steam will flow off, leaving 1-9th to be expelled from the cylinder by the return of the piston, which will require a force of 1-9th of 63680, or will equal 7075 foot pounds, leaving as available force for 1 lb. of steam, expanded to six volumes at a constant temperature of 286°, $177775 - 7075 = 170700$ foot pounds, that is, leaving friction and all other losses out of consideration. And in using steam at a constant pressure of 25 lbs. at the end of the stroke, 24-25th parts would flow off to the condenser, leaving 1-25th part to be expelled by the piston, which would require a force equal to 1-25th of 59756, or 2310 foot pounds, leaving as available force for 1 lb. of steam, at a pressure of 25 lbs., without any expansion, $59756 - 2310 = 57446$ foot pounds, being very *little more* than one-third of the work realized from the same quantity of steam, at a pressure of 55 lbs., and expanded to six volumes.

So that it appears, if Mr. Fairbairn's statement is near the truth, steam must have half the pressure after expanding to a double volume, independent of a fall in temperature, and the pressure in the condenser must not exceed 1 lb. on the square inch, and, in addition to this, it must also be ascertained

that the product of the volume and pressure of any given weight of saturated steam increases with the pressure, as there is reason to believe that, in place of increasing, as is generally conceived, this is a diminishing quantity.

Notwithstanding the increase of temperature, along with pressure, it is not known whether 1 cubic foot of saturated steam, at a pressure of 10 atmospheres, weighs more or less than 10 cubic feet at a pressure of 1 atmosphere.

Moreover, in considering the advantages of this expansive action over that generally derived from the ordinary condensing engine, it should not be brought in comparison with an engine supposed to work with steam at full pressure throughout the whole stroke, as all engines expand more or less; and when steam is cut off at 2-3rds of the stroke, expanding at a constant temperature of 240° through the remaining 1-3rd, the gross action of 1 lb. of steam would be equal to $59756 \times 1{\cdot}4054 = 83960$ foot pounds; and assuming the pressure in condenser at 1 lb., as before, 3585 foot pounds would be required to expel the vapour left in the cylinder, leaving as available power from 1 lb. of steam, as frequently used in the ordinary condensing engine, $83960 - 3585 = 80375$ foot pounds.

And again, in place of using steam at a pressure of 55 lbs., if the pressure was reduced to one-half of that, say 22½ lbs., and the temperature raised to 286°, as before, say, by maintaining a high pressure in the boiler and cylinder-jacket, or by heating the steam after leaving the boiler, as recently practised in America, the product of the volume and pressure would be the same as before, as this depends (assuming steam to be a perfect gas) entirely upon the temperature; and in expanding to six volumes, the gross load raised would be the same; but as the volume of vapour left in the cylinder at the end of the stroke would be double, the force required to expel this into the condenser would also be double, unless the pressure in the condenser could be reduced to ½ lb. on the square inch, which corresponds to a temperature of 80°, when the power realized would be the same in both cases. But in dealing with steam at a temperature beyond that due to its pressure, a degree of certainty can be entertained in regard to the results, as it is only the density of steam, isolated from water and superheated, that is yet known, the number being, as I have stated, nearly ·623, whereas very little is known in regard to the weight of saturated steam at temperatures no higher than those due to the pressure; there is, however, reason, as I have said, to believe that it increases in a greater ratio in density than in pressure, and further, when steam is used in the cylinder at the full pressure due to its temperature, it is continually condensing in the cylinder, and re-evaporating from the cylinder into the condenser at each stroke of the engine; and this evil, which likewise vitiates the vacuum, increases with the rate of expansion, so that it may be the loss which arises from this alternate heating and cooling of the cylinder which has led some engineers of much experience to declare the advantages of expansion, when carried beyond a very limited extent, to be altogether a delusion; and although (as Mr. Fairbairn observes) expansion in two cylinders does not theoretically produce more power than in one, still, in using two, they might have different temperatures, by which this evil may be mitigated.

In Mr. Wickstead's experiments with the Cornish engine, over 100,000 lbs. of water was actually raised 1 foot for each pound of water evaporated, with steam at a pressure less than 1¼ atmospheres, and cut off at nearly one-third of the stroke, expanding fully two-thirds; and the same engine, which had a stroke of 10 feet, actually raised 74,000 lbs. of water 1 foot for each pound of water evaporated with steam at a pressure of 14·6 lbs., or rather less than atmospheric pressure admitted into the cylinder during 6·03 feet of the stroke, and expending through the remaining 3·97 feet only; but although the working pressures were low, the boiler and steam jacket were maintained in the former case at a temperature of 284°, and in the latter at 252°.

Now the Watt and Boulton engine, with which Mr. Wickstead also experimented, and which had a stroke of 7·97 feet, scarcely raised 45,000 lbs. of water 1 foot for each pound of water evaporated, although the steam had a pressure of 17·7 lbs. admitted into the cylinder at the full boiler pressure during 5 feet of the stroke, expanding through the remaining 2·97 feet; and this engine had also a steam-jacket, but filled with steam at the temperature only due to the working pressure (222°.)

High temperature is, therefore, I conceive, of much greater importance in a condensing engine than very high pressure; and the specific heat of steam, as determined by Regnault, being ·475, or less than half that of water, one-third of the quantity of heat required to convert 1 lb. of water into steam at 212°, if added to the steam, will more than double its volume.

The power derived from steam, air, or other caloric engines, depends upon the force with which the steam or other body expands, compared with that required for its compression, and the difference of those forces depends entirely upon the difference

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of temperature. So that with any pair of temperatures, as has been demonstrated by Professor Thomson and W. M. Rankine, the power realized from any given quantity of heat, is the same for all substances, and the greater the difference between the temperature of expansion and compression, the greater proportion will the heat converted into power bear to the whole quantity used, or the greater will be the quantity of heat which leaves the boiler compared to that (the largest portion) which is simply transferred into the condenser and wasted.

As no power can be derived from any quantity of water without difference of level, neither can power be derived from any quantity of heat without difference of temperature. 10 measures of water falling through 100 feet will produce as much power as 100 measures falling through 10 feet; and so may 10 measures of heat, falling through 100° in temperature produce as much power as 100 measures falling through 10°. Water falling from a high level may elevate a larger quantity to a less height, and so may a good steam engine, with a supply of water at a temperature of about 50°, convert a greater quantity of this water into ice than the steam which drives the engine would be capable of melting, and at the same time a few degrees in temperature would be added to a larger quantity of water than the fire at the boiler would be capable of heating. The cold and heat produced would, however, not be equal to each other, as power would be required to convey heat from a cold to a warmer body, and the excess of heat produced would be equivalent to the force necessary; and this force would again depend entirely upon the difference of temperatures; but when the force necessary is known, the excess of heat may also be estimated, as it is believed to have been determined, with a great degree of accuracy by Mr. Joule, that 1 lb. weight of matter falling from a height of 772 feet (or moving at a velocity of 222 feet per second) produces as much heat as would raise in temperature 1 lb. weight of water 1° Fahr.; and this quantity is now generally termed one measure or unit of heat.

I am, Sir, yours, &c.,

JAMES BROWNLEE.

City Saw Mills, Glasgow, June 26, 1855.

ON THE MANAGEMENT OF BOILERS.

To the Editor of the Mechanics' Magazine.

SIR,—It has at last been generally concluded, in this district, among the manufacturers and others using steam power, that, after the repeated boiler explosions, causing great destruction of life and property, some remedy should be devised; such a feeling has, therefore, led to the formation of an association, of the principal engineers and manufacturers, for the purpose of having a regular system of inspection, by a competent engineer, of the boilers used by them. No one will deny that the object contemplated is a good one, as far as it goes, but at the same time the association will be found not to meet the requirements generally; in other words, it is not those wealthy and influential manufacturing firms that require such strict supervision, as they can have the best work and best materials, coupled with the most scientific skill in the production of the engine and boilers to be used by them. It is rather those who use steam power from ten to twelve hours, and who cannot or will not employ a competent engineer to execute their orders.

I am drawn to make these remarks, by noticing the evidence of an explosion which took place a short time ago in Salford. It appears there was no water-gauge to the boiler, and that a new safety valve placed upon the boiler had no passage for the escape of steam, and consequently there was no indication of the pressure existing at all; we are also told that the valve and fittings were made and examined by a person professing to call himself an engineer. Here then is a case in an obscure but dense part of the town, in which the boiler is in a most dangerous condition, and worked by dangerous hands, for the stoker was said to be only eighteen years of age. The owner is not, of course, a member of the association, and therefore they have no power or authority to make the necessary inspection, which might have saved both life and property. It is in such cases as this that a more arbitrary and compulsory measure is required to compel the owner to have the boiler in a better working condition. It may be asked how is this to be done, and considered unsafe for parliament to interfere, and so on. Government has interfered, and said to the mill-owners, you shall not work beyond the ten hours, you shall have your shafting boxed off, and therefore why not add that their boilers shall also be kept in a good condition; and if they compel in one case, let them compel in the other. It must at the same time be understood, that they appoint an engineer, qualified in every way for the office, and not some favourite "colonel" or cousin of Sir Somebody, and then appoint another to do the duty after all, under the above-named gentleman. I believe something of this kind must be done before the evil spoken of is done away with.

There is another feature that ought to be well looked after, namely, the construction and principle of the safety-valve to be used. Now we often hear one engineer recommend one form of safety-valve, another again will try to convince you his arrangement is best and safest; both, perhaps, employing more parts and joints than there is any occasion for. That valve is best that fulfils the following plain conditions: not liable to stick fast in its seat; least friction in the joints or centres; clear thoroughfares for the escape of the steam; combined with a perfect system of prevention of overweighting. There ought to be no complication, no delicate workmanship to get out of order. In a word, every part and principle of it ought to be simple and easily understood by those that are likely to have its attendance.

I am, Sir, yours, &c.,

ENGINEER.

Manchester, June 27, 1855.

ARCHER'S SCIENTIFIC DRAMA.

To the Editor of the Mechanics' Magazine.

SIR,—In your last number, under the title of "Andraud's Scientific Drama," I observed an ingenious article suggesting the calling in the aid of science as an ancillary to the resuscitation of the drama. Without wishing to rob our French neighbours of any merit in this matter, permit me to offer some little original claim to this idea (albeit, like many other novelties, not carried out for want of encouragement at the hands of enterprise), I having, in 1849, composed a melodrama, in which, conjointly with human plot and action, the grand appliances of the *electric telegraph* and of *electricity* were made in scenic and sentimental form to illustrate all that was marvellous, amusing, or romantic, and yet truthful in life and death, love and hate, virtue and vice, crime and commerce.

My melodrama, also, in "five acts" (with a musical overture, recitative, and scene representing the Hall of the Genius of Electricity and Telegraphs, "music of spheres," and various other devices), was submitted both to B. Webster, of the Haymarket, and Charles Mathews, of the Lyceum, who were much pleased with it, but no actual attempts were made to represent it, the objection to the "getting up" of it being the *mechanical* difficulties to be surmounted in the legerdemain and telegraph departments.

Were it suited to the more highly useful and philosophic field so admirably occupied by your periodical, I should have been pleased to contribute it to your pages; but should you favour me with a notice of the matter, it will be held in much estimation by,

An old subscriber and member of the press,

CHARLES MAYBURY ARCHER,

Author of "Anecdotes of the Electric Telegraph" and "Guide to the Electric Telegraph."

3, St. James'-gardens, Haverstock-hill, July 2, 1855.

USEFUL APPLICATION OF THE PERIWINKLE SHELL.

To the Editor of the Mechanics' Magazine.

SIR,—I find that the periwinkle-shell, of about the third of an inch diameter, makes a very efficient igniter for my percussion-blasting-cartridge; also for my alarm fog-signal for railways. The shell, when well cleaned out, will contain three heads of Bell's congreves, which can be kept in their places by means of an envelope of thin tough paper. When this so charged shell is crushed between two hard substances, its fractured parts will act like broken glass.

I am, Sir, yours, &c.,

J. NORTON.

Rosherville Hotel, Gravesend, 2nd July, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BROWN, THOMAS, of Manchester, Lancaster, silk manufacturer, and PETER MAC GREGOR, of the same place, manager. *Improvements in machinery or apparatus for cutting velvets or other similar piled fabrics.* Patent dated December 8, 1854. (No. 2583.)

This invention applies solely to the cutting of such velvets or similar piled goods or fabrics as are woven with a double cloth, and consists in the employment of a revolving circular knife or cutter furnished with an inner and outer guard or guide, the revolving knife being opposed to the pile, and operating between the two cloths, separating them when cut. The guards are adjustable, so that they may be made to suit different thicknesses of fabric and depths of pile.

ACRES, EDWARD, of Pouldrew Mills, Waterford, miller. *Improvements in drying wheat and other grain.* Patent dated December 8, 1854. (No. 2584.)

This invention consists in the combination of a heating apparatus with an apparatus for agitating and spreading the grain. The heating apparatus consists of a stove, the fire-box of which is encased in a jacket, pierced at the lower part of the two sides and back with holes or openings through which air is supplied to the fire-box by means of a conduit of masonry extending round the sides and back. The agitating

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apparatus consists of a vertical shaft fitted with radial arms some of which carry cane-brushes, and with coulters.

THOM, JOHN, of Birk-acre, near Chorley, Lancaster, calico-printer. *Improvements in apparatus for singeing or firing cotton or other fabrics.* Patent dated December 9, 1854. (No. 2585.)

This invention consists in the application to the apparatus now in use for singeing or firing cotton and other fabrics of an arch, flues, &c., by which the sparks, dust, and smoke are conveyed from about the firing-plate to the under side of the fire-grate, for the purpose of being consumed.

HIGGINS, JAMES, of Salford, Lancaster, machine-maker, and THOMAS SCHOFIELD WHITWORTH, of the same place, mechanic. *Improvements in the manufacture of bayonets, and in machinery or apparatus connected therewith.* Patent dated December 9, 1854. (No. 2588.)

The main feature of this invention consists in manufacturing bayonets from several portions of bar metal, the blade and socket being produced in one piece without welding.

MANIERE, EDWARD, of Bedford-row. *Improvements in lamps.* (A communication.) Patent dated December 9, 1854. (No. 2593.)

The main feature of this invention consists in placing the oil reservoir above the level of the burner, and in so forming and disposing it that its inner surface shall act as the reflector of the lamp.

JOHNSTON, NATHANIEL, of Bordeaux, merchant. *Improvements in arranging buildings and apparatus for breeding, rearing, preserving, and carrying leeches.* (A communication.) Patent dated December 9, 1854. (No. 2594.)

This invention mainly consists in forming under cover artificial marshes in buildings capable of being artificially heated and ventilated, by means of which the breeding, rearing, and maturing of leeches are to be improved and facilitated.

NICHOLSON, JOSEPH ALFRED, of Chapel-place, Bermondsey, Surrey. *An improvement in the manufacture of dinner and dessert or table-forks.* Patent dated December 9, 1854. (No. 2595.)

This invention consists in forming the interior parts of the teeth of table-forks in such manner that each tooth or prong may come to a line or single edge at its inner part, by which arrangement forks may be very readily wiped clean between the prongs.

TAYLOR, GEORGE, of Liverpool, Lancaster, merchant, of the firm of Jacot, Taylor, and Tipper, Water-street. *Improvements in regulating the action of governors of steam and other engines.* Patent dated December 9, 1854. (No. 2596.)

This invention consists in providing a single rod with centrifugal balls of equal weight, one on each end; in resting the rod upon pinions at the centre of a revolving pillar; and in providing the pillar with a spring, which, when properly adjusted or connected with the rod, causes it and the balls "to act independently of the laws of gravity, reversely to the centrifugal force."

KING, JAMES JOHN, of Leonard-square, Finsbury, Middlesex, and THOMAS BRINDLEY, of the same place, fancy leather-workers. *Improvements in cigar-cases and other similar cases.* Patent dated December 9, 1854. (No. 2598.)

The improved cigar-case is formed of such a thickness as to afford space for one cigar, and of sufficient breadth to contain the quantity required; the whole of the bottom is opened by means of a plug or lid, which is removed when the case is supplied. At the opposite end of the case there is a small opening furnished with a hinged lid, and a tendency to close this lid is produced by a slight spring. When this lid is opened, the cigars are instantly pressed towards that part of the case in which the opening is, so that the end of one will always be immediately under the spring lid.

JACQUOT, FRANÇOIS, of Bruxelles, manufacturer. *Improvements in the lining of hats, helmets, shakos, caps, and similar articles.* Patent dated December 11, 1854. (No. 2599.)

The inventor forms convex linings for hats, &c., of a tissue or looped fabric of silk or other fibrous substance, or of a perforated sheet of caoutchouc, gutta percha, leather, or other suitable material, so as to allow of the passage of air, and at the same time to present a light, soft, and elastic surface to the head of the wearer.

GUTHRIE, CHARLES THOMSON, of New Bond-street, Middlesex. *Improvements in angles, T-squares, straight edges, parallel rules, and other similar instruments employed in drawing.* Patent dated December 11, 1854. (No. 2601.)

Claim. — Forming angles, T-squares, straight edges, parallel rules, and other similar instruments employed in drawing of glass.

HARVEY, WILLIAM JAMES, of Exeter, gun-maker. *Improvements in fire-arms when revolving barrels are used.* Patent dated December 11, 1854. (No. 2602.)

In the inventor's revolver there is a slot formed in an enlargement made under the long barrel to receive the end of a lever, and the ramrod is attached to this lever by a pin joint. The stock is made with a recess to

receive the lever and ramrod, the recess being closed in by a door, or cover. A second bolt is added to the safety-bolt for additional security.

CRAIG, WILLIAM GRINDLEY, of Gorton, Lancashire, engineer *Improvements in railway axle-boxes and spring fittings.* Patent dated December 11, 1854. (No. 2604.)

A full description of this invention will be given hereafter.

DODDS, ISAAC, of Sheffield, York, engineer. *Certain improvements in machinery or apparatus for working the slide or steam valves of steam engines.* Patent dated December 11, 1854. (No. 2605.)

This invention consists in the employment of a peculiar arrangement of slide motion instead of the "link motion" and "wedge motion" hitherto employed. We shall publish an illustrated description of the invention hereafter.

BEMROSE, WILLIAM, the younger, and HENRY HOWE BEMROSE, of Derby, booksellers, printers, and stationers. *Improvements in the mode of and machinery for punching and perforating paper and other substances.* Patent dated December 11, 1854. (No. 2607.)

This invention consists in a mode of punching or perforating sheets of paper, card-board, &c., by the aid of rotatory punching or perforating cylinders or rollers, in conjunction with corresponding counterpart cylinders or rollers.

PULS, FRANCIS, of Whitechapel-road, philosophical instrument maker. *Improvements in electro-galvanic apparatus for medical purposes, part of which improvements are also applicable to other electro-galvanic apparatus.* Patent dated December 11, 1854. (No. 2608.)

These improvements have especial reference to the arrangement of an electro-galvanic apparatus which we shall shortly describe, and by which is to be produced, according to the inventor's statements, an electric action more powerful both in quantity and intensity than any that has been obtained from batteries hitherto in use.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved manufacture of conducting wire for electric telegraphs.* (A communication.) Patent dated December 11, 1854. (No. 2609.)

The object of this invention is to produce a wire for the transmission of electric currents that shall possess the strength of iron and the conducting power of copper. For this purpose iron wire of any suitable gauge or strength is provided, and coated with copper by the aid of the electrotype process.

EBERT, CHRISTIAN HENRY RICHARD, and LIPPMAN JACOB LEVISOHN, both of Old-street, St. Luke's, Middlesex. *Improvements in the mode of rendering certain cases or receptacles extensible.* Patent dated December 11, 1854. (No. 2610.)

The inventors cause the back ends of pocket-books, pocket-cases, &c., the top and bottom of porte-monnaies and lady's companions, and the backs of desks, and of any compartments therein, to be formed by an extensible band or connecting piece, composed wholly or partly of India rubber, gutta percha, or other suitable elastic material.

LARKIN, RICHARD, lock-maker, of St. John's-villas, Highbury, Middlesex. *Improvements in the construction of locks and keys.* Patent dated December 12, 1854. (No. 2611.)

Claims.—1. The combination in any suitable arrangement of the barrel lock of secondary or complementary slides or stop-pieces with the slides upon which the key acts, for the purpose of making such lock changeable. 2. The application to any suitable arrangement of the barrel lock of a catch movement, to receive or otherwise change the bearing of any pressure given through the keyhole to the moveable stop-pieces, for the purpose of causing them to bind. 3. The application to any such lock of a separate piece for moving the bolt, so connected with the revolving barrel that any application of undue pressure to force round the barrel would detach it from the piece, and preclude the possibility of the barrel acting on the bolt. 4. The introduction to any such lock of certain walls passing through the slide upon which the key acts, to prevent access to the interior of the lock. 5. The construction of a changeable key for any suitable arrangement of the barrel lock, with step-slides which are either loosened or secured in their places by the action of a screw-nut which encircles them. 6. The construction of a key having a hole through the entire length of its shaft or axis. 7. The construction of a changeable lock, in which the secondary or complementary slides are fixed in the places given to them by the form of the key, by a binding pressure imparted by the act of locking. 8. The construction of a changeable lock, in which the key remains stationary during the acts of locking and unlocking. 9. The construction of a changeable lock, the slides or tumblers of which, in their arrangement for the purpose of locking or unlocking, are moved towards the steps of the key. 10. The construction and application of a carriage for conveying the key through the keyhole into the lock. 11. The construction of an indefinitely changeable key, the step-slides of which are moved and fixed in

one and the same plane, and parallel to each other. 12. The construction of a tumbler lock, in which the upper tumbler nearest the keyhole is made to receive the force of any pressure given by the action of the bolt to the stump, while the keyhole remains open, leaving the rest of the tumblers free.

BACHHOFFNER, GEORGE HENRY, of Upper Montagu-street, Middlesex. *Improvements in the construction of fire-places for the better consumption of smoke, and in lighting and maintaining fires.* Patent dated December 12, 1854. (No. 2612.)

The inventor places within and above the ordinary fire-grate a moveable diaphragm furnished with bars (like an ordinary false grate or bottom) which, by a rack motion or other means, may be raised up or lowered and sustained at any point. Upon this he places anthracite coal, coke, charcoal, or other non-bituminous fuel. The fire may be lighted in the ordinary way, or by means of a gas-poker, described by the inventor, and consisting of a hollow poker, perforated at the end, and connected with a flexible tube, through which gas is supplied. The fire being lighted in the lower grate with coals or other bituminous fuel, the upper grate is brought close down upon the ignited coals in the lower grate, and the anthracite, coke, &c., then becomes ignited, and remains in an incandescent state, "so that the smoke from the lower fire will be consumed," says the inventor, "as it passes through the incandescent mass above." Fresh coal is to be put on the lower fire, the upper one being raised for the purpose.

WHITE, TIMOTHY, of Landport, Portsmouth, lead, glass, oil, and colour-merchant. *Improvements in constructing portable houses, and other buildings and structures.* Patent dated December 12, 1854. (No. 2613.)

In carrying out this invention open frames of bar iron are made, and connected together by screw-bolts and nuts. The sheets of iron, of the sizes of the frames, have their edges turned up so as to pass between the two outer bars of two neighbouring frames, and they are nipped and held between them by a strip of vulcanized India-rubber, felt, or other packing being introduced, to make the joint air and water-tight.

CHIPPINDALE, WILLIAM, of Leeming Bar, near Bedale, and LEONARD ROBERT SEDGWICK, of Crakehall, near Bedale, York. *Improvements in steam boilers.* Patent dated December 12, 1854. (No. 2614.)

The inventor describes a vertical apparatus composed of a double cylinder fitted with interior vertical tubes, and closed in by a steam chest above, the furnace being placed within the inner cylinder and the fire-door opening through the double cylinder. The spaces between the cylinders and within the tubes are water spaces.

MAYER, JOS, of Dale-hall Pottery, Longport, Stafford, manufacturer, and JOHN DAVID KIND, of Birmingham, Warwick, manufacturer. *An improvement or improvements in door-knobs or handles made of china, earthenware, glass, or other vitreous or semi-vitreous substance, and in attaching the said knobs or handles to their spindles.* Patent dated December 13, 1854. (No. 2615.)

Claims.—1. A method of attaching mounts to door-knobs, or handles, of china, earthenware, or other vitreous or semi-vitreous substance, by expanding the mounts in the interior of the knobs. 2. Constructing mounts for door-knobs or handles of malleable or annealed cast-iron. 3. Affixing mounts to door-knobs or handles, by means of guttta percha, or mixtures composed mainly of gutta percha. 4. A method of giving steadiness to the motion of door-knobs or handles by the application of a disc beneath the rose.

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *A machine for cutting keys.* (A communication.) Patent dated December 13, 1854. (No. 2616.)

This invention consists in the arrangement of a lathe carrying a circular cutter or saw, with a compound slide rest supporting a vice or carriage swinging between centres, by means of which the bit of the key is brought into the proper position in contact with the cutter in order to produce steps or cuts of any required depth and at any required distance from each other.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in sewing machines.* (A communication.) Patent dated December 13, 1854. (No. 2618.)

This invention consists chiefly in substituting for the shuttle commonly used in producing the interlocked stitch, a thread case which carries the locking thread so arranged relatively to the line of motion of the needle that instead of requiring, like the shuttle, a movement of its own to carry its thread through the loop in the needle thread, it has the loop drawn over it by the needle.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in photography.* (A communication.) Patent dated December 13, 1854. (No. 2620.)

A full description of this invention was given on page 611 of our last number.

JULLION, JOHN LOUIS, of Combe-house, Tovil, Kent, analytical chemist. *Separating certain vegetable fibres from mixed fabrics for various useful purposes.* Patent dated December 13, 1854. (No. 2621.)

This invention consists in separating flax and cotton fibres from others of wool and silk with which they may be combined in fabrics, "and in order to effect this object," says the inventor, "I avail myself of the properties of caustic alkalis and alkaline earths on the one hand, by which I am enabled to dissolve or decompose the animal matter in the said fabrics, without affecting the vegetable fibre—and of the property of acids on the other hand, with which by the assistance of heat, a disorganization of the vegetable without affecting the animal fibre."

FISHER, SAMUEL, of Birmingham, Warwick, engineer. *Certain improvements in ordnance and in machinery and apparatus to be employed in manufacturing the same.* Patent dated December 13, 1854. (No. 2624.)

Claims.—1. The manufacture of wrought iron steel-lined ordnance, or ordnance manufactured of iron partially converted into steel, by forming the metal into rings, and afterwards welding those rings to the breech, whilst in the furnace, by means of certain described apparatus, or any mere modification of the same. 2. The manufacture of malleable iron ordnance by combining a wrought iron breech with a malleable iron barrel or cylinder.

HAIMES, THOMAS, of Melbourne, near Derby. *Improvements in warp machinery.* Patent dated December 13, 1854. (No. 2627.)

This invention relates to the instruments used in joining up the edges or selvages of two fabrics simultaneously made of two warps in a warp machine.—"Heretofore," says the inventor, "in such cases there has been found great difficulty in so arranging and working the needles and instruments, that the join of two edges, or selvages shall be done in such manner as to appear similar to the other parts of the fabrics. For this purpose a point is applied to the needle bar at the selvage and in the points used to hold the work in the proper position there is at the edge or selvage provided a hook, and these instruments are so worked as to uphold for a time the selvage loop and prevent its being pressed off." The second part of the invention consists in the application of needles with droppers, or lever covers, to the beards, or hooks, in constructing circular warp machines, &c.

COURT, JOHN, junior, of Sheerness, Kent, builder. *Improvements in rockets.* Patent dated December 13, 1854. (No. 2629.)

Claims.—1. The construction of a rocket, arranged suitably to be introduced into a gun, and to prevent windage as described, and to reverse its ends by the force of the charge in its flight. 2. Constructing rockets with an igniting tube leading from the fore end to the tail end. 3. Making the tail end of rockets, with passages and planes inclined to the longitudinal axes thereof, so that the ignited products of the rocket composition rushing through the apertures shall, when they have escaped those passages, pass direct from the ends of the rockets for the purpose of obtaining rotary motion.

REDGATE, JAMES, of Sneinton, Nottingham, lace manufacturer, JAMES THORNTON, of Nottingham, and EDWIN ELLIS, of Sneinton, Nottingham, lace manufacturer. *Improvements in machinery for the manufacture of lace and other fabrics.* Patent dated December 14, 1854. (No. 2630.)

This invention relates to bobbin net or twist lace machinery in which the parts are constructed and arranged in such manner that the crossings, twistings, and intersections of the bobbin threads with the warp threads are produced by the carriages so as to complete the work without the necessity of taking up points.

EVANS, LLEWELLYN WILLIAM, and JAMES M'BRIDE, of Saint Helen's, Lancaster, manufacturing chemists. *Certain improvements in the burning of sulphuret ores for making sulphuric acid, and for smelting.* Patent dated December 14, 1854. (No. 2632.)

Claim.—"The burning of the sulphuret ores beforementioned in the manufacture of sulphuric acid, and for smelting in close kilns, or furnaces, in combination with a blast pipe or pipes, or other mechanical agents whereby the air necessary for combustion is driven into the kiln, or furnace, and among the sulphuret ores under treatment."

SCOTT, WILLIAM CHARLES, of Warner-road, Camberwell, Surrey, gentleman. *Improvements in paddle-wheels.* Patent dated December 14, 1854. (No. 2635.)

The inventor arranges paddle-wheel floats round the wheels in inclined positions, in such manner that between every pair a space is left at the middle of the breadth of the wheel. In some cases he provides a duplicate set which is used in backing astern, and in others he hinges the original set, and makes them answer for motion in both directions.

CORNIDES, LOUIS, of Trafalgar-square, Charing-cross, Middlesex. *Certain improved apparatus for coating or covering surfaces of glass, or other material, with collodion.* Patent dated December 14, 1854. (No. 2637.)

Claim.—The principle of coating surfaces with collodion in an air-tight chamber, so that the vapour of æther which arises during the coating and drying is not suffered to escape, but is collected and con-

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densed into æther. Also, certain described apparatus, in combination with a still, for the purpose of practically applying the principle.

ROSE, JAMES, of Ashford-station, South Eastern Railway, Kent. *An improvement in constructing the fire-boxes of steam-boilers.* Patent dated December 14, 1854. (No. 2638.)

This improvement consists in forming a fire-box of a steam boiler "with upright parallel protruding enlargements from the water spaces into the fire-box, the protruding enlargements of the water spaces being made with inclined ends."

CLARK, WILLIAM, of Upper-terrace, Islington, Middlesex, engineer. *Improvements in anchors.* Patent dated December 15, 1854. (No. 2640.)

The inventor considering the short horns of Porter's, or the swivelled anchor, objectionable, because of the upper one presenting an obstacle liable to be fouled, dispenses with them by jointing the flukes to the shank with a joint in a position somewhat concentric with the arms or flukes.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CASTELOT, ELOI PAULIN, of Lierre, Belgium, refiner. *Improvements in decolorizing the juices of beet-root, sugar-cane, and raw sugar, and reducing or neutralizing the excess of lime contained therein.* Application dated December 8, 1854. (No. 2578.)

"I propose," says the inventor, "to use animal black or charcoal in powder, blood, milk, &c., in direct combination with the juices of beet-root or sugar-cane, or by preparatory ebullition with raw sugar and water, and thus defecate such juices."

McCONNELL, JAMES EDWARD, of Wolverton, Bucks, civil engineer. *Improvements in the construction and arrangement of ordnance.* Application dated December 8, 1854. (No. 2581.)

These improvements relate to the manufacture of ordnance from wrought iron in a manner similar to the mode now adopted in manufacturing the inventor's patent hollow axles. The trunnions are added afterwards in any convenient manner. They also relate to a method of mounting guns in a combined form, and in fitting them with cranks so arranged as to neutralize the recoil.

HINDE, THOMAS CALLENDER, of Birmingham, Warwick, merchant and manufacturer. *An improvement or improvements in ordnance.* Application dated December 9, 1854. (No. 2586.)

The inventor takes a plate of iron of suitable dimensions, bends it into a cylindrical form, and welds the edges together, so as to make a hollow cylinder. The end of the cylinder, which is intended for the breech end of the cannon is then closed in any convenient manner.

CORTLAND, JOHN, of Wellesley-street, Stepney East, Middlesex. *The safety of life at sea or in rivers.* Application dated December 9, 1854. (No. 2587.)

The inventor proposes to construct and place on the deck of a vessel, a self-disconnecting raft or bridge, composed of a wooden frame carrying air-tight tanks, tubes, or caissons.

HALE, GEORGE, of Tavistock-street, Covent-garden, Middlesex, boot and shoemaker. *Certain improvements in obtaining and applying motive power.* Application dated December 9, 1854. (No. 2589.)

In carrying out this invention power is to be obtained by causing certain weights, applied to or connected with rotating arms or levers, to act upon and drive a central shaft. The weighted levers are jointed, and so arranged, that when they are intended to act by their gravity on the shaft to be driven they will be extended outwards to their greatest extent, and, on the contrary, when they are to be raised they are kept unextended.

BUCHHOLZ, GUSTAV ADOLPH, of Hammersmith, Middlesex, civil engineer. *Improved machinery applicable to the hulling or cleaning of grain, seeds, and other vegetable produce.* Application dated December 9, 1854. (No. 2590.)

This invention consists of improvements upon an invention patented December 24, 1853. See *Mech. Mag.*, vol. lxi. p. 64. (No. 2614.)

MORISON, RICHARD JAMES, of Old Brompton, Middlesex, lieutenant in the royal navy. *Improvements in propelling ships and vessels.* Application dated December 9, 1854. (No. 2591.)

This invention consists in employing one or two screw propellers in the fore-part of the vessel between a false cutwater and the stem.

BUTTON, REUBEN, of Hackney, Middlesex, upholsterer. *Improvements in locks and keys.* Application dated December 9, 1854. (No. 2592.)

These improvements consist—1. In so constructing locks, that access to the interior thereof is cut off to all except the proper key. 2. In so constructing locks that should access by possibility be gained to the interior, none but the proper key can shoot the bolt. 3. In constructing locks with an additional spring catch to the bolt. And the improvement in keys consists in constructing the body thereof in two parts, held together when out of the lock by a spring or springs.

DAVIS, WILLIAM, of the Old Kent-road,

Surrey. *Improvement in furnaces.* Application dated December 9, 1854. (No. 2597.)

The inventor proposes to admit air at the door of a furnace through suitable regulating valves, and to admit an additional supply at the bridge, the latter supply being heated by passing through hollow fire-bars which turn up at their extremities and form the bridge, the vertical portions of such bars alternately rising nearly up to and falling short of the bottom of the boiler.

JAMES, WILLIAM, of Crosby-hall Chambers, London, iron merchant. *Improvements in the manufacture of spikes, bolts, screws, pins, and other similar articles.* Application dated December 11, 1854. (No. 2600.)

The inventor proposes to produce spikes, bolts, &c., that will hold well in the material into which they are driven, by making threads or feathers on the sides of the bolt or spike; by giving the shank of the bolt a twist during the process of manufacture, these threads or feathers are made to assume a spiral direction so as to form a kind of screw.

STEVENS, NEHEMIAH EDWARD, of Tonbridge-wells, Kent, architect. *A mode of joining or connecting together blocks of stone and other building materials.* Application dated December 11, 1854. (No. 2603.)

This invention consists in connecting blocks of stone, wood, bricks, &c., by means of a groove and tongue-piece.

BELLHOUSE, EDWARD TAYLOR, of Manchester, Lancaster, engineer, and ROBERT THOMAS, of the same place, oil-merchant. *Improvements in cranes or hoisting apparatus.* Application dated December 11, 1854. (No. 2606.)

This invention relates to a mode of actuating the winding barrels or pulleys of cranes, or machinery for hoisting bodies, by means of ratchet-gear, whereby the vibratory movements of the attendant's hands are made to communicate rotatory motion to the hoisting apparatus in a series of detached impulsive actions, instead of by a continuous and direct rotatory action as in the ordinary winch.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *An improved ink-stand.* (A communication.) Application dated December 13, 1854. (No. 2619.)

The patentee describes an ink-stand which is furnished with a reservoir from which the ink is forced out, by means of a piston, as it is required.

GRANT, CHARLES WILLIAM, of Bath, Somerset, a lieutenant-colonel on the retired list of the Indian army. *Certain apparatus for the production of draught, and prevention of smoke in domestic stoves and fire-places.* Application dated December 13, 1854. (No. 2622.)

This invention mainly consists in fixing a funnel or tube of a conical shape just above the fire-place, and making it of such a length that it extends some distance up into the flue.

BERDAN, HIRAM, of New York. *Compressible life-boat.* Application dated December 13, 1854. (No. 2623.)

The inventor constructs a boat with ribs hinged to the keel, and a metal gunwale hinged or linked on each side to the stem and stern-post, in such manner that when the boat is not in use the sides may fold down and the boat be compactly stowed.

TAYLOR, CHRISTOPHER JAMES, of Handsworth, Stafford, agent. *Improvements in protecting under-ground telegraph wires.* Application dated December 13, 1854. (No. 2625.)

This invention consists in enclosing under-ground telegraph wires in an iron casing formed of an upper and under skelp or strip, the under one being flat and turned up at right angles at the edges, and the upper one formed nearly semi-circular in section and slightly turned back at the edges.

EVANS, THOMAS FINNEMORE, of Philpot-lane, London. *Improvements in the manufacture of candles.* (A communication.) Application dated December 13, 1854. (No. 2626.)

This invention consists in acting on fatty and oily bodies with nitrous gases which are free from nitric acid, by which means a product is obtained which, after it has undergone the saponifying process, is fit for the manufacture of candles.

TAYLOR, WILLIAM CREES, of Catherine-grove, Greenwich. *Improvements in constructing the bearing parts of shafts and axles.* Application dated December 13, 1854. (No. 2628.)

This invention consists in clothing the bearing parts of shafts and axles with wood.

RUSTON, RICHARD, of Lansdown Villas, Northumberland-street, Vauxhall-road, Birmingham. *Improvements in anchors.* Application dated December 14, 1854. (No 2631.)

This invention consists in giving to an anchor elasticity in the direction of the length of the shank. For this purpose the shank is made of two parts, one sliding within the other; the end of one part is formed with or fixed to the arms and the end of the other to the stock, a spring or springs being introduced to connect the two parts together.

PADWICK, WILLIAM FREDERICK, of Hayling Island, Hants, gentleman. *An improvement in projectiles.* Application dated December 14, 1854. (No. 2633.)

This invention consists in inserting into

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the sides of projectiles, or in forming them with, rings, feathers, pins, or studs, which, working in the grooves of the guns, cause the projectiles to rotate round their axes when they are projected from the guns.

HENDERSON, PETER EDWIN, of Trafalgar-square, Charing-cross, Middlesex, civil-engineer. *Improvements in ventilating ships.* Application dated December 14, 1854. (No. 2636.)

The inventor proposes to ventilate ships by driving air into their various parts by means of fan-wheels which receive rotary motion from the water.

ROWLEY, JOHN, of Camberwell, Surrey. *Improvements in machinery or apparatus for embossing natural and artificial leather, and woollen, cotton, paper, silk, and other woven or felted fibrous materials, the said improvements being more particularly adapted to those machines in which heat is employed for effecting such said embossing.* Application dated December 15, 1854. (No. 2639.)

Instead of the ordinary fly-press hitherto employed for exerting pressure upon the embossing dies, the inventor employs pressure rollers or cylinders of metal, the surfaces of which are plain, &c.

SCOTT, URIAH, of Duke-street, Adelphi, Middlesex, engineer. *An improved method of constructing hollow and solid metallic bodies.* Application dated December 14, 1854. (No. 2641.)

This invention consists in "the gradual construction and formation of any body by the employment of sheets or layers of the required metal with or without other material."

PROVISIONAL PROTECTIONS.

Dated March 13, 1855.

558. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in musical wind-instruments. A communication.

Dated March 20, 1855.

627. Henry Thomas Williams, Archway, Guildford-street, and Keppel Mews North, Russell-square, London. An improved method of making an easel.

Dated April 25, 1855.

935. François Joseph Anger, of Stamford-street, Blackfriars-road, Surrey, merchant. A new metallic alloy. A communication.

Dated May 1, 1855.

974. George Wigzell Knocker, of Bushy Ruff, Dover, Kent, gentleman. Improvements in motive power by means of water and air.

Dated May 9, 1855.

1046. Samuel Cunliffe Lister, of Bradford, York, manufacturer. Improvements in treating old ropes, also old canvas and gunny bags, and similar materials, part of which improvements are also applicable to hemp, flax, rhea, and other similar fibre, to render parts of the fibres suitable to be spun.

Dated May 16, 1855.

1101. Wilfrid Latham, of Liverpool, Lancaster, merchant. Improvements in cutting the terry or pile of certain textile fabrics used for saddle-covers.

Dated May 26, 1855.

1195. William Simson Young, of Leith, Mid-Lothian. Improvements in steam boiler furnaces, and in the prevention of smoke therein.

Dated June 2, 1855.

1265. Henry Galante, of Place Dauphine, Paris, France. An improved surgical injection-bottle.

Dated June 4, 1855.

1267. Mary Staite, of Liscard, Chester. The manufacture of a new black paint.

Dated June 5, 1855.

1276. Francis Puls, of Soho-square, Middlesex, chemist. Improvements in electro-coating iron.

Dated June 6, 1855.

1289. John Gedge, of Wellington-street South, Middlesex. Improvements in the manufacture of flat tiles. A communication from Mr. C. J. B. J. Vaultrin, of France.

Dated June 13, 1855.

1345. Frederick Collier Bakewell, of Haverstock-terrace, Hampstead, Middlesex. Improvements in apparatus for supplying furnaces with hot air. A communication from Calvin Fletcher, of North America.

1346. Frederick Collier Bakewell, of Haverstock-terrace, Hampstead, Middlesex. Improvements in rotating breech fire-arms. A communication from Josiah Ells, of the United States of America.

1347. John Avery, of Essex-street, London. Improvements in oscillating steam-engines. A communication.

1348. William John Blackman, of the Hippodrome, Kensington, Middlesex. A new medicine or syrup for the cure of coughs.

1349. Edward Rush Turner and Frederick Turner, of Saint Peter's Foundry, Ipswich, Suffolk, engineers. Improvements in machinery or apparatus for crushing and grinding grain, seeds, and pulse.

1350. William Moxon, of Rochdale, Lancaster, mechanic, and John Clayton, of the same place, carpet manager. Certain improvements in looms for weaving carpets or other looped fabrics.

1351. Henry Henson Henson, of Parliament-street, Westminster, civil engineer. Improvements in the construction of portable and other buildings, and in the means of ventilating buildings.

1352. Joseph Betteley, of Liverpool, chain cable manufacturer. An improvement in the manufacture of iron knees for ship-building.

1353. Joseph Betteley, of Liverpool, chain cable manufacturer. An improvement in ships' anchors.

1354. George Cottam, of Winsley-street, Oxford-street, Middlesex, engineer. Improvements in hay-racks and harness brackets.

1355. George Arthur Biddell, of Ipswich, Suffolk. Improvements in the manufacture of machines for cutting or grinding vegetable and other substances.

1356. Edwin Lodge, of Mirfield, York, manufacturing chemist, and George Marshall, of Huddersfield, chemist and druggist. Certain improvements in the production of animal and vegetable naphtha, ammonia, and charcoal, and also for the evolution of the carburetted and olefiant gases therefrom.

Dated June 14, 1855.

1357. Godfrey Sinclair, of Regent-street, Middlesex, gentleman. Improvements in signalling between the engine-drivers and the guards of railway trains.

1359. Joseph Enouy, of Denbigh-place, Pimlico, Middlesex. The means of "removal" of every rotary or "revolving barrel or cylinder" containing chambers, from all revolver pistols, guns, and fire-arms, and the "substitution" in their place by another, and other "barrels or cylinders" in succession.

1360. Alexander Robertson, of Saint Mary, Middlesex, engineer. A new manufacture of packages for dry or moist goods or liquids.

1361. Felix Leloup, engineer, of Paris, French empire. Certain improvements in treating textile fabrics or substances for separating cotton or other vegetable substances from wool, silk, and other animal products. A communication.

1362. Samuel Cunliffe Lister, of Manningham, Bradford, York. Improvements in treating silk waste, also the noils of silk, wool, and goats' wool or hair, before being spun.

1363. James Timmins Chance, of Birmingham. Improvements in glass flattening furnaces. A communication.

Dated June 15, 1855.

1364. William Hewitt, of Bristol, Somerset, gentleman. Improvements in propelling vessels.

1365. William Clay, of Liverpool, Lancaster, iron manufacturer. An improved manufacture of bar iron.

1366. William Clay, of Liverpool, Lancaster, iron manufacturer. The application of certain descriptions of bar iron to purposes where great strength or stiffness is required.

1367. Henry Bridgewater, of Alfred-place, Bedford-square, Middlesex, gentleman. An improved construction of spike for railway and other purposes.

1368. William Lee, of Duke-street, Westminster, civil engineer. Improvements in water-closets.

1369. Hippolyte Mathis, négociant, of Rue Notre Dame des Victoires, Paris. Improvements in preserving wood. A communication from D. Boucherie.

1370. John Harvey Sadler, of Lady Pitt-lane, Hunslet, Leeds. Improvements in looms for weaving.

1371. George Frederick Morrell, of Fleet-street, London, ink manufacturer. An improvement in ink-bottles or ink-vessels.

Dated June 16, 1855.

1372. Dumont Pallier, of Broad-street, Lambeth, Surrey, grease manufacturer. Improvements in the manufacture of soap or saponaceous substances.

1373. William Jones, of Birkenhead, Chester, boiler-maker. Improvements in machinery for punching and shearing plates of metal, which improvements are also applicable to stamping and pressing metals and other substances.

1374. James Webster, of Birmingham, Warwick, engineer. A new or improved balance.

1375. Lazare François Vaudelin, of Upper Charlotte-street, Fitzroy-square. Improvements in railway breaks or brakes.

Dated June 18, 1855.

1377. John Sellars, of Monsall House, near Manchester, starch and gum manufacturer. Improvements in the manufacture of starch, and in the use of substances employed therein.

1378. Isidore Carlhian and Isidore Corbiere, of Castle-street, Holborn, London, lamp-manufacturers. Improvements in moderator lamps.

1379. Louis Henri Réal, doctor, of Paris, French empire. Certain improvements in elastic bottoms or seatings for beds, mattresses, and seats.

1380. Richard Peaker, of Methley, York, corn-miller, and Thomas Bentley, of Wakefield, corn-miller. Improvements applicable to machinery for grinding wheat and other grain, cement, and other substances.

1381. William Henry Wilding, of New-road, Middlesex, civil engineer. Improvements in furnaces.

1382. Henry Bessemer, of Queen-street place, New Cannon-street, London, engineer. Improvements in screw-propellers, and in the shafts and cranks by which they are driven, which improvements are also applicable generally to the shafts and cranks of marine, stationary, and locomotive steam-engines.

1383. William Little, of the Strand. Improvements in printing-machinery.

1384. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of cast steel, and mixtures of steel and cast iron.

1385. Thomas Blanchard, mechanical engineer, of Rue Drouot, Paris, France. A new and improved method of bending timber.

1386. Henry Bessemer, of Queen-street-place, New Cannon-street, London, engineer. Improvements in the manufacture of ordnance.

1387. Henry Francis, of West Strand. Improvements in cutting out parts of garments or articles of dress.

1388. Henry Bessemer, of Queen-street-place, New Cannon-street, London, engineer. Improvements in the manufacture of rolls or cylinders used in the lamination, shaping, and cutting of metals, in crushing ores and other substances, and in calendering, glazing, embossing, printing, and pressing.

1389. Edward Myers, of Rotherham, York, engineer. Improvements in machinery or apparatus for raising water or other liquids.

1390. Henry Bessemer, of Queen-street place, New Cannon-street, London, engineer. Improvements in the manufacture of railway-wheels.

1391. Edward Myers, of Rotherham, York, engineer, and John Wright Potter, of the same place, gentleman. Improvements in buffers, draw-springs, and bearing-springs.

1392. John Jones, of Sheffield, York, engineer. Improvements in obtaining motive power.

1393. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in furnaces or fire places. A communication from Nicolas François Corbin-Desboissieres, of Paris, France, metallurgical chemist.

Dated June 19, 1855.

1394. Charles Antoine Hartmann, gentleman, of Paris, French empire. Certain improvements in the preparation or combination of colours for printing stuffs and textile fabrics.

1396. Edwin Dixon, of Wolverhampton, Stafford, manufacturer, and Thomas Bailey, of Wolverhampton, brass-founder. A new or improved tap or cock.

1398. John Macintosh, of Great Ormond street, Middlesex. Improvements in fuses, fusees, and matches.

1400. James Letchford, of Duncan-place, Hackney, Middlesex metallic bedstead-maker. An improved construction of folding bedstead.

1402. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the storing and treatment of grain. A communication from Jean Gustave de Couinck, of Havre, France, merchant.

Dated June 20, 1855.

1404. Daniel Benjamin Herts, of Cornhill, London. An improved life-preserving harness. A communication from George Yellott and Samuel Hunt, of Maryland, United States of America.

1406. Robert Bewick Longridge, of Manchester, Lancaster, engineer. Improvements in the construction of steam-boilers and malleable iron tubes.

1408. James Gernon, of Buckingham-street, Adelphi, Middlesex. Improvements in the manufacture of articles of clay. A communication.

[redacted]

1410. Robert Walker, of Glasgow, merchant, and Alexander McKenzie, of Glasgow, mechanist. Improvements in electric telegraphs.

1412. Robert Watson Savage, of Saint James-square, Middlesex, patent door-spring manufacturer. Improvements in single and double-action swing-doors.

1414. Elise Cochaud, widow, of Paris, France. Improved apparatus to be used in making aerated or gaseous liquids.

1416. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for polishing or finishing thread. A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 3rd, 1855.*)

367. David Hulett. Improvements in apparatus for heating, cooking, and lighting by gas. Partly a communication.

420. Alexander Brown. Improvements in the manufacture of paper, and in the production of textile materials.

429. Benjamin Fothergill and William Weild. Improvements in machinery for combing cotton, wool, flax, silk, and other fibrous materials.

433. Alexander Symons. An egg-cooking apparatus. A communication.

436. Jesse Brickles, Thomas Thorpe, and Joseph Lillie. Improvements in the manufacture of plain and ornamental woven fabrics.

439. Charles Frederick Stansbury. An improved mode of ringing fog-bells. A communication from Charles G. Page, of Washington, United States of America.

533. Thomas Hill. Certain machinery or apparatus to be employed in the manufacture of bricks, drain-pipes, tiles, and other like articles, from plastic materials.

547. Joseph Malcomson, Robert Shaw, and William Horn. Improved expansion-valves for steam-engines.

556. David Macaire. Improvements in casks and taps.

558. Auguste Edouard Loradoux Bellford. Improvements in musical wind-instruments. A communication.

575. Joseph Turner. An improvement in coffin-furniture.

613. Philippe Roehrig. A new or improved alimentary substance.

636. Matthew Semple. Improvements in railway-breaks.

666. Claude Antoine Busson. Improvements in feeding apparatuses applicable to machines for treating textile materials.

783. Auguste Edouard Loradoux Bellford. Improvements in pumps. A communication from John Hoyes M'Gowan, jun., of Cincinnati, United States.

1036. Robert Kanzow Bowley. Improvements in boots and shoes, and other coverings for the human foot.

1046. Samuel Cunliffe Lister. Improvements in treating old ropes, also old canvas and gunny bags, and similar materials, part of which improvements are also applicable to hemp, flax, rhea, and other similar fibre, to render parts of the fibres suitable to be spun.

1122. Julius Jeffreys. Improvements in sun-blinds or solar screens.

1131. Paul Firmin Didot. An improved process of bleaching paper-pulp, textile fabrics, and other substances or matters.

1193. William Simson Young. Improvements in steam-boiler furnaces, and in the prevention of smoke therein.

1203. John Avery. Improvements in apparatus for conveying heavy weights for bridge-building and other purposes. A communication.

1209. Joseph Bennett Howell. A new or improved mode or modes of consuming more effectually the gas and gaseous products evolved during the combustion of fuel.

1297. William Baines. Improvements in certain parts of railways, and for the methods of manufacturing and constructing part of the same.

1312. Isaie Lippmann. Improvements in the treatment of hides and skins for the manufacture of leather.

1323. Samuel Colt. An improvement in the construction of fire-arms.

1324. Samuel Colt and William Thomas Eley. Improvements in the manufacture of cartridges.

1327. Frederick Collier Bakewell. Improvements in bench-planes. A communication from William S. Hopper, of the United States of America.

1335. Isaie Lippmann. Improvements in dyeing or colouring the hides and skins of animals.

1338. Nathan Hackney. An improvement in the manufacture of earthenware, china, and porcelain.

1343. Henry William Ford. Improvements in machinery or apparatus for effecting agricultural operations.

1344. John Charles Brant. Improvements in laying rails, chairs, and sleepers, for the permanent way of railways.

1345. Frederick Collier Bakewell. Improvements in apparatus for supplying furnaces with hot air. A communication from Calvin Fletcher, of North America.

1346. Frederick Collier Bakewell. Improvements in rotating-breech fire-arms. A communication from Josiah Ells, of the United States of America.

1354. George Cottam. Improvements in hay-racks and harness-brackets.

1362. Samuel Cunliffe Lister. Improvements in treating silk waste, also the noils of silk, wool, and goats' wool or hair, before being spun.

1365. William Clay. An improved manufacture of bar iron.

1366. William Clay. The application of certain descriptions of bar iron to purposes where great strength or stiffness is required.

1368. William Lee. Improvements in water-closets.

1371. George Frederick Morrell. An improvement in ink-bottles or ink-vessels.

1378. Isidore Carlhian and Isidore Corbiere. Improvements in moderator-lamps.

1393. John Henry Johnson. Improvements in furnaces or fire-places. A communication from Nicholas François Corbin Desboissères, of Paris, France, metallurgical chemist.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed June 22, 1855.

700. John Blair.
707. William Crozier.
741. Peter Rothwell Jackson.

Sealed June 26, 1855.

2724. Frederick Samson Thomas and William Evans Tilley.
2727. George Carter and Henry Cyrus Symons.

1855.
4. George Crane and John Jackson Crane.
12. John Keir Harvey and Daniel Pearce.
13. Felix Gabriel Célestin Lehaynin.
14. Hippolyte Fontaine.
21. Alexander Southwood Stocker and Samuel Darling.
43. John Huggins.
65. William Coles Fuller.
72. Alexander Robertson.
90. Richard Archibald Brooman.
401. William John Macquorn Rankine and John Thomson.
735. George William Friend.
835. Edward Hammond Bentall.
837. George Beard.
854. Richard Bridge.
871. Peter Lear.
879. William Ryder.
890. Edwin Pettitt.
891. William Gerhardi.
896. John Henry Johnson.
897. John Henry Johnson.
903. Joseph Whitworth.
916. Matthew Andrew Muir.
920. William Symington.
923. James Wallace, jun.
947. Thomas Haley Burley.

Sealed June, 29, 1855.

2746. Andrew Dietz and John G. Dunham.
16. William Kendall and George Gent.
25. George Walker Muir.
28. George Bowden.
64. Edward Booth.
83. François Victor Guyard.
94. John Graham.
121. Ambroise Quertinier.
142. Charles Frederick Stansbury.
161. John Henry Johnson.
164. Henry Carr.
192. John Henry Johnson.
294. Alfred Vincent Newton.
490. Richard Van Valkenburgh De Guinon.
794. Charles Blunt and Joseph John William Watson.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin; W. C. Campbell and Co., Hamburg.*

[redacted]

Mechanics' Magazine.

No. 1666.] SATURDAY, JULY 14, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

BRAMWELL'S PATENT IMPROVEMENTS IN TRUNK ENGINES.

Fig. 3 Fig. 2.

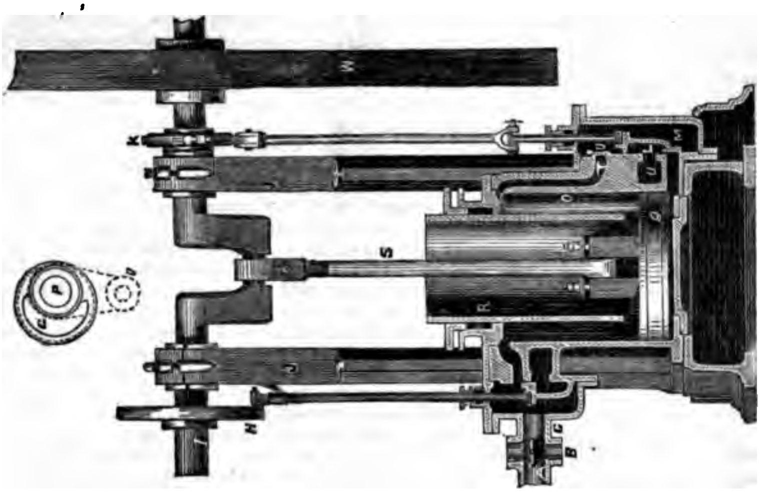
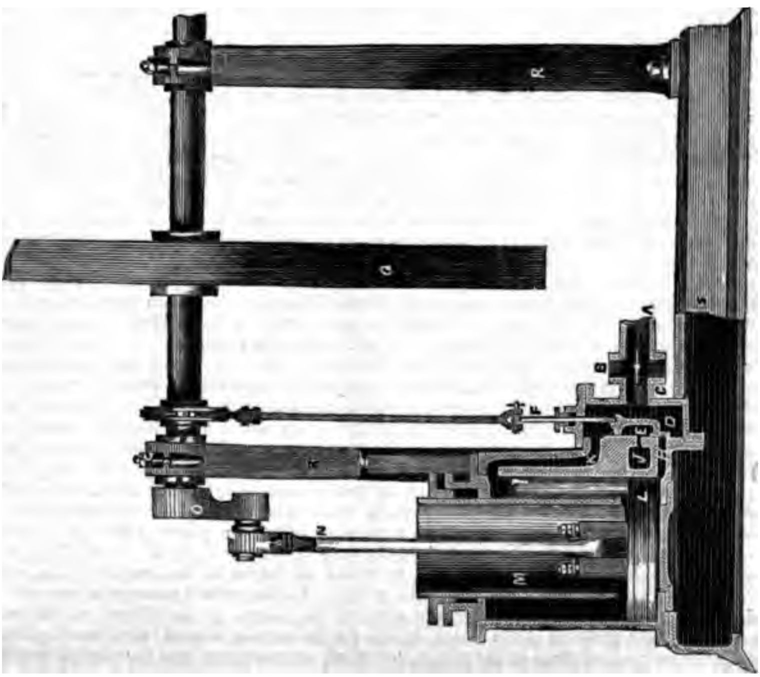


Fig. 1.



BRAMWELL'S PATENT IMPROVEMENTS IN TRUNK ENGINES.

(Patent dated November 15, 1854.)

Mr. F. J. Bramwell, the engineer of the English Combined Vapour Engine Company, has recently filed the specification of a patent, the first part of which relates to the steam trunk engine, and consists in so constructing such an engine, that although it has a single trunk working through one end of the cylinder only, or dissimilar sized trunks working through opposite ends of the cylinder. the power developed in the stroke and that in the outstroke of the engine, whatever the pressure of the steam employed, "may be made to be more nearly equal to each other than can be done by any of the present arrangements of this class of engine, except when working in connection with a condenser, and in using steam at about 10 to 15 lbs. per square inch above the atmosphere."

Fig. 1 is a side view partly in section of such a single trunk non-condensing steam-engine; fig. 2 shows the crank and eccentric of the engine, with a portion of the crank shaft which carries them. A is the pipe to bring the steam from the boiler, and in which is, B, the throttle valve, bolted to, C, a branch on the back of, D, the slide jacket, in which is, E, the slide, which, by, F, the stalk, and, G, the eccentric, with its rod, is moved so as to alternately admit and shut off the steam from, H, the passage to the bottom of, I, the cylinder, and also alternately to put this passage in connection with, J, the eduction passage; K is a passage always open to the slide jacket, D, and leading to the top of the cylinder; L, the piston, furnished with, M, the trunk, the area of which is about one-half the area of the cylinder, and in which is, N, the connecting rod, giving motion to, O, the crank, fixed on, P, the crank shaft, which carries, Q, the fly wheel, and is supported on, R, R, the frames, which are fixed to, S, the bed plate, to which is also attached the cylinder, I.

The action of the engine is described by the inventor as follows:—"Assume that the piston L is at the bottom, as shown, and that the slide jacket D, the passage K, and the annular space above the piston L, are filled with steam, and assume that by the rotation of the fly wheel Q, the action of the eccentric G causes the slide E to rise and to admit steam by the passage H below the piston L; this steam will then exert its force on the whole area of the under side of the piston L, while it is also pressing on the annular area of the upper side; upward motion of the piston will then be produced with a power equal to the pressure of the steam multiplied by the whole area of the under side of the piston L, less the resistance above, which would equal the pressure of the steam multiplied by the area of the annular space, equal to about one-half of the piston area, as before mentioned; the effective upward force would therefore be the pressure multiplied into about one-half of the area of the piston. During the ascent of the piston L, the steam which was contained in the annular space would be expelled through the passage K into the slide jacket D, and would form a portion of that which would enter below the piston. When the piston L had arrived at the top of its stroke, and the eccentric G by its action had lowered the slide E, so as to put the bottom passage H into communication with the eduction passage J, and had thus suffered the steam which was below the piston to escape, then the steam continuing to press on the annluar area of the upper side of the piston L, and not being resisted by the pressure below, would cause the piston L to descend, and the power with which it would descend would equal the area of the annular space multiplied by the pressure of the steam; but as this annular space is equal to the half of the area of the piston, or nearly so, then the effective downward force on the piston would be the multiplication of this pressure into this half area, but this is equal to the force with which the piston ascended; the engine therefore is working in balance. When this principle is to be applied to a condensing engine, the relative areas of the piston and trunk should be varied, so as to produce as nearly as possible an equality of action both in the upward and downward stroke, having regard to the ordinary pressure of steam, and the amount of uncondensed steam left in the cylinder. For example: if the uncondensed vapour remaining in the cylinder is on an average 3 lbs. per square inch, and the pressure of the steam above atmosphere in the cylinder is also ordinarily 36 lbs., then the area of the trunk to the piston should be about 2 to 3, leaving 1 for the annular space. In the down stroke the effective force would be the pressure of the steam (36 lbs.) added to the partial vacuum below of 12 lbs., equal to 48 lbs. on an area of one, *i. e.*, the annular space, to which is to be added the pressure of the atmosphere above, the uncondensed steam remaining below the piston equal to 12 lbs., and which pressure would also be exerted on the area of the trunk (equal to 'two'); the effect of which would therefore be 24 lbs., to be added to the 48 on the annular space, equal to 72, as the whole downward energy of the piston. In the upward stroke the pressure would amount to 36 lbs., multiplied by the area of the piston = to 'three' = 108 lbs., but resisted by the pressure of the steam, 36 lbs. on the annular area of 'one,' leaving 72 lbs. as the effective upward force of the piston, by which arrangement also the engine would work *in balance*."

[redacted]

In the above description no provision has been made for working the steam expansively beyond the slight amount that would be obtained from the little "lap and lead," shown on the slide and eccentric. In engines where, although the top passage K is always left open, a greater amount of expansion is required than is shown by this arrangement, it may be obtained by giving more lap and lead to the slide E, and by working it by an eccentric, or by a cam, or by a link motion, or by having separate pipes to convey the steam to the top side of the piston, and to the slide jacket D, and by having in this latter pipe an ordinary expansion valve; but whichever of these methods may be adopted, the effect of the expansion will be to give an average pressure on the under side of the piston less than that on the upper side. To equalize the power produced by these different pressures, the area of the trunk should be increased above the half of the total area of the piston, so as to compensate by the increase of the effective area of the under side for the decrease in the pressure per square inch, as compared to the pressure exerted on the upper side of the piston.

The invention also embraces a further improvement in trunk engines with single trunks or dissimilar sized trunks, as before described, by a mode of working the steam expansively in them. Fig. 2 is a side view, partly in section, of such a single trunk non-condensing steam engine. A is the steam pipe, in which is placed, B, the throttle valve, which is bolted to, C, a branch of, D, a slide jacket, in which is, E, a slide, which alternately puts, F, the top passage, into communication with the steam in the jacket, D, and with G, the top eduction passage. This slide, E, is by means of suitable rods worked by, H, a cam, fixed on, I, the crank shaft, which is supported on frames, J, J, and carries, K, an eccentric, which by its rod gives motion to, L, a slide, contained in, M, a slide jacket, and which serves to put N, the bottom passage of, O, the cylinder, into alternate connection with the slide jacket, M, with, P, the bottom deduction passage. Q is the piston, carrying, R, the trunk, the area of which is about one-half that of the piston, and in which is fixed, S, the connecting rod, which gives motion to the crank shaft; T is an equilibrium passage, which proceeds from the top of the cylinder to the slide jacket, M, and which has on it, U, a valve, which would open to allow steam to pass out from the cylinder by this passage, but would close to prevent its return; V, is a bed plate, to which the frames, J, J, and cylinder, O, are bolted; W, is the fly wheel.

The action of this engine is thus described by the inventor:—"Assume that the piston, Q, is at the bottom, as shown, and that the slide jacket, D, the top passage, F, the annular space above the piston, Q, and the equilibrium passage, T, and the slide jacket, M, are filled with steam; and assume that, by the rotation of the fly wheel, W, the action of the eccentric, K, would cause the slide, L, to rise. and thus to open the bottom passage, N, to the steam in the jacket, M: then this steam would enter below the piston, Q, and would exert an upward pressure, which, as before described, would be effective on so much of its area as exceeded the annular space, say, as before, one-half. Assume, also, that when the piston had ascended a certain distance, say one-fourth of its stroke, the cam, H, had raised the slide, E, so as to prevent any more steam from entering into the cylinder; then the steam which was contained in the annular space above the piston, Q, in the equilibrium passage, T, the jacket, M, and that which was below the piston, Q, would commence to act on it by its expansive energy, and the piston, Q, would still ascend by the force due to the pressure of the steam, multiplied by the excess of area of the piston above the annular space, as above mentioned. Assume, further, that when the piston, Q, had ascended, say one other fourth of its stroke, that the cam, H, were to move the slide, E, still higher, so as to connect the annular part above the piston by means of the passage, F, with the top eduction passage, G; then the steam contained in this annular space would escape, and that steam which was below the piston would be prevented from returning to the upper side along the equilibrium passage, T, by means of the valve, U, which would close. The steam below the piston would then continue to expand, and although its energy would be more feeble than if the whole steam had been retained, nevertheless the effect would be greater, as its action would no longer be confined to the excess of the area of the piston above that of the annular space, but would be exerted over its whole area, as the annular surface would no longer be pressed on by the steam. When the piston had arrived at or near the top, the action of the cam, H, would have caused the slide, E, to descend, so as to be ready to readmit steam above the piston, Q, while the eccentric, K, would have lowered the slide, L, so as to have shut off the bottom passage, N, from the jacket, M, and to have commenced to open it to the exhaust, P, by which the expanded steam contained below the piston, Q, would be liberated, and the steam from the boiler admitted on to the annular space would be able to exert its full force to drive the piston, Q, downward."

The inventor also describes another method, which consists in making the top slide, E, perfectly plain (that is to say, not a box slide), so as merely to cover, F, the top passage. By this arrangement the steam can be cut off from entering the cylinder above the piston, but the *whole of it must be expanded*, no portion of it being suffered to escape.

POLLUTED STATE OF THE THAMES.

On entering a steam-boat about mid-day on Saturday last, at the Surrey side of London-bridge, we observed that we had descended into an atmosphere of a singularly noxious character. On looking round with the expectation of discovering some local source of offence, our attention was at once drawn to the water which moved sluggishly past us, and which presented an unusually foul and loathsome appearance. Considering this to be the source from which the injurious vapours surrounding us were exhaled, we were not surprised to find that as the vessel advanced with us through the thick dark stream, the same odour continued to attend us, until we gladly disembarked at Paul's-wharf, and ascended into the far purer atmosphere of St. Paul's churchyard. We have since found that at about the same time the space between London and Hungerford bridges was traversed by Professor Faraday, who has subsequently done good service by calling public attention to what he then observed. As we do not think we can add anything important to his admirable remarks, we here append them, and leave them to the serious reflection of our readers. He says, "The appearance and the smell of the water forced themselves at once on my attention. The whole of the river was an opaque pale brown fluid. In order to test the degree of opacity, I tore up some white cards into pieces, moistened them so as to make them sink easily below the surface, and then dropped some of these pieces into the water at every pier the boat came to; before they had sunk an inch below the surface they were indistinguishable, though the sun shone brightly at the time; and when the pieces fell edgeways the lower part was hidden from sight before the upper part was under water. This happened at St. Paul's-wharf, Blackfriars-bridge, Temple-wharf, Southwark-bridge, and Hungerford; and I have no doubt would have occurred further up and down the river. Near the bridges the feculence rolled up in clouds so dense that they were visible at the surface, even in water of this kind.

"The smell was very bad and common to the whole of the water; it was the same as that which now comes up from the gullyholes in the streets; the whole river was for the time a real sewer. Having just returned from out of the country air, I was, perhaps, more affected by it than others; but I do not think I could have gone on to Lambeth or Chelsea, and I was glad to enter the streets for an atmosphere which, except near the sinkholes, I found much sweeter than that on the river.

"I have thought it a duty to record these facts that they may be brought to the attention of those who exercise power or have responsibility in relation to the condition of our river; there is nothing figurative in the words I have employed, or any approach to exaggeration; they are the simple truth. If there be sufficient authority to remove a putrescent pond from the neighbourhood of a few simple dwellings, surely the river which flows for so many miles through London ought not to be allowed to become a fermenting sewer. The condition in which I saw the Thames may perhaps be considered as exceptional, but it ought to be an impossible state, instead of which I fear it is rapidly becoming the general condition. If we neglect this subject, we cannot expect to do so with impunity; nor ought we to be surprised if, ere many years are over, a hot season give us sad proof of the folly of our carelessness."

RUSSIAN INFERNAL MACHINES IN THE BALTIC.

Since the publication in our last number of the description given by the *Times'* correspondent of these machines, we have received the following illustrated account of them from a naval correspondent who is now with the Baltic Fleet, and upon whose accuracy we confidently rely. (The engravings are on a scale of 1¼ inches to a foot.)

The Russian torpedo consists of an iron case, A A, in the form of a cone, on the apex of which, at B, is fitted a swivel, to which is affixed the mooring rope, H, adjusted to such a length as to hold the machine at the required depth below the surface of the water. On the base, C, (fig. 2), is fitted a movable or sliding bar, D D, sustained in its outward position by the spring, *d d*, which bar projects, as shown, slightly beyond the base of the cone. In the centre of the base of the cone is fitted the arrangement shown partly in section in (fig. 1), which consists of a strong hollow plug of nine inches in length and nearly two inches in diameter, but tapering to one inch at its lower end. In the interior of this hollow plug is fitted the hollow tube, *a a*, suspended by its centre, *b*, which tube can oscillate, when the cap, *e*, is drawn upward, in the outward plug or tube, as shown.

The *modus operandi* is as follows: the cone, or what we may call more correctly the "hydraulic shell," is charged with the explosive mixture in the whole of its interior, E E, and the tube, as shown in section, being fitted in its place, the *torpedo* has only to be sunk to the requisite depth,

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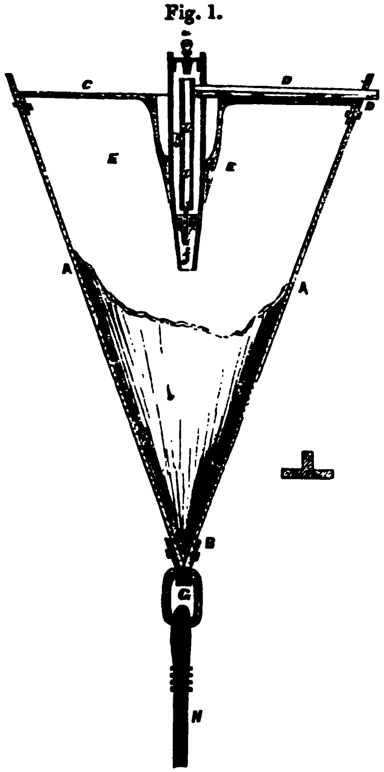
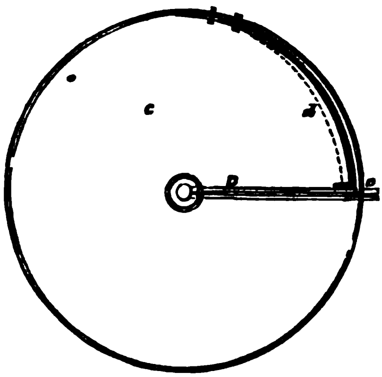
and on a vessel coming in contact, the cone being free to revolve, it will turn on its

Fig. 1.



axis, G, until the projecting point or end of the sliding bar, D D, (a section of which is given in fig. 3), is pressed inward, when

Fig. 2.



the tension of the spring, *d d*, being overcome, it assumes the position shown by the dotted lines, and pressing against the inner tube, *a a*, causes it to move out of the vertical position, in which it is shown, and at the same time break the fine glass tube, *f*, which contains the chemical fluid for causing the explosion.

Forty of these cases have been picked up already in the vicinity of Cronstadt, and our drawing is a representation of one that, on its explosion on the 18th, caused the lamentable accident by which it is feared Admiral Seymour will lose his eyesight. Many of them are in passage home by the steam transport "Jupiter."

RUSSIAN FIELD MINES AT SEBASTOPOL.

The following account of the small mines which the Russians have planted thickly about their advanced works at Sebastopol, and which are exploded by the touch of the foot, is given in a communication by the correspondent of the *Times*:

"A strong case containing powder is sunk in the ground, and to it is attached a thin tube of tin or lead, several feet in length; in the upper end of the tube there is enclosed a thin glass tube containing sulphuric or nitric acid. This portion of the tube is just laid above the earth, where it can be readily hid by a few blades of grass or a stone. If a person steps on it, he bends the tin tube, and breaks the glass tube inside. The acid immediately escapes, and runs down the tin tube till it arrives close to its insertion into the case, and there meets a few grains of chlorate of potass. Combustion instantly takes place, the mine explodes, and not only destroys everything near it, but throws out a quantity of bitumen, with which it is coated, in a state of ignition, so as to burn whatever it rests upon. Later in the day, I very nearly had a practical experience of the working of these mines; for an English sentry, who kindly warned me off, did not indicate the exact direction till he found he was in danger of my firing it, when he became very communicative on the subject. One of them blew up during the armistice, but I do not know what damage it did. We have lost several men by them. While the ground is occupied by the Russians, they mark them by small flags, which are removed when the enemy advance. It makes it disagreeable walking in the space between the works."

ANNIVERSARY DINNER OF THE SOCIETY OF ARTS, &c.

The One Hundred and First Anniversary Dinner of the Society for the Encourage-

ment of Arts, Manufactures, and Commerce, took place on Tuesday, July 3rd, at the Crystal Palace, at Sydenham. About three hundred and fifty gentlemen were present on the occasion. The chair was occupied by His Grace the Duke of Argyll, F.R.S., and speeches were delivered on the occasion by the Chairman, Mr. Tite, M. P., Mr. Crossley, M.P., Mr. Frith, Mr. J. M. Rendell, F.R.S., Professor Owen, the Rev. Dr. Booth, F.R.S., the Hon. and Rev. Samuel Best, Earl Granville, Sir J. Paxton, M.P., and Viscount Ebrington, M.P.

In the course of the speech with which he proposed the toast of the evening — "Prosperity to the Society"—the Noble Chairman said: If I were asked to mention a circumstance which would impress upon our minds more than any other the amazing progress which has taken place in this country during the last century, I would remind you that a hundred years ago Watt and Arkwright had not begun their labours — those works which have changed the whole face of society—those labours which, I rejoice to think, are being now largely prosecuted by the Nasmyths, the Whitworths, and the Paxtons of the present day; and, gentlemen, I would say there are some who have been afraid that the progress of this country in arts and manufactures, tending to concentrate the attention of the people, as it undoubtedly does, upon the possession and the getting of wealth, would tend to dull our spirit as a nation, and make us more reluctant to perform our duties in the world. I think, however, that the experience of the last eighteen months must have silenced all such doubts. Never has there been a more truly national spirit exhibited — never has there been shown a greater willingness to submit to great burdens for the sake of great national duties, and I would say further, nowhere has that spirit been more nationally evinced, than in the great seats of our commerce and manufactures. And, gentlemen, I cannot allude to this subject without expressing the earnest hope, which I am sure is felt by every gentlemen present at this table, that the events which have brought us into close alliance with our great neighbour, which is of great importance, not for war only, but for the purposes of peace, and that when this contest shall have ended, I was going to say, when it shall have been forgotten, but forgotten it never can be; but when this contest shall have passed away, those two nations will continue to emulate each other in all the arts of industry and of peace. I am sure of this, that the close connection which ought to be kept up between these two great countries, will be of immense benefit to the arts and manufactures of both. The armies have acknowledged that there are peculiar parts belonging to each, which they have felt in the hour of battle, and in the arts and sciences we must confess the peculiar excellence of each, from which we may derive mutual advantage. Undoubtedly, gentlemen, that particular in which I believe we excel almost every other nation, is that which is peculiarly connected with the operations of this Society, I mean the command over the natural powers and over the mechanical inventions which have been given to England by the progress of her arts and manufactures. Now, gentlemen, I know that this Society directs itself mainly, not to the abstract sciences, but to the sciences as they are applied to the practical arts; but I hope, gentlemen, you will allow me, who have the honour of being President elect of the British Association for the Advancement of Science in the ensuing year, to say one word in this meeting with regard to the encouragement of science simply as such. In one of the ablest lectures on the Results of the Great Exhibition of 1851, which were given in the hall of our Society at the instance of our Royal President—I mean the lecture given by Professor Whewell, he observed, with great ingenuity and truth, that the arts have generally preceded the sciences, that just as men have constructed language, before grammars have been written, so there have been artificers in wood, in metal, and in stone, before the chemical qualities of these various substances had been found out, and science constructed upon the arts. This is undoubtedly true, but we must all recollect of late years, such has been the rapid advance of abstract sciences, that science has gone ahead of the practical arts. There is not a single month, there is not a single day, in which the abstract discoveries of the chemist, of the mechanic, and of the mathematician, are not called into practical operation for the purposes of the arts and the commerce of the country. Professor Whewell admits this in regard to chemistry and several of the other sciences; but the more you look into this matter, the more you will find that the practical arts and commerce of the country are drawing upon the resources of abstract science. All I can say with regard to this subject is, that I think we, as a commercial country, ought to appreciate abstract science and encourage the inventions of those connected with it. Upon this occasion, beneath the roof of the Crystal Palace, I feel that I have a perfect right to divest myself of all official character, and to consider myself as unconnected with the Government of the country; and in this character I am certainly prepared to say, that I do not think that the Government of this

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country, meaning thereby not any particular ministry, but the governments generally of this country, have been sufficiently liberal towards matters of science. But then I would remind you that the Government of this country is but a reflex of public opinion, and if you put forth the opinion, which I believe is a sound one—if you, the great mechanical classes, demand the sciences to be more liberally promoted by the Government, depend upon it your wishes will ultimately be attended to by the Government. I rejoice to see that the attention of this Society is not confined exclusively to the accumulation of material wealth, but that of late the labours of the Society, and the exertions of the members, have been directed almost as much to the intellectual culture of those great classes which our manufacturing industry has raised up amongst us.

ON THE MANUFACTURE OF FIRE-ARMS AT MANCHESTER.

SEVERAL months ago it was mentioned that the government had given a contract to Mr. Francis Preston, of Manchester, for the manufacture of a great number of bayonets and ramrods for the army. Mr. Preston's steam machinery for making spindles was found adapted to the purpose; and as at Birmingham these things are made by hand, it was seen that a great saving of time would be effected by placing the order with Mr. Preston, who has just filed the specification of a patent, since obtained, for improvements in bayonets, and in the machinery for manufacturing them, of which we shall probably give an illustrated description hereafter. The contract with this gentleman has since been extended, and nearly all the most eminent engineers and mechanicians in Manchester and its neighbourhood have also received inducements from the Executive to turn their attention to the improvement and manufacture of fire-arms and *matériel* of war. The *Manchester Guardian* says: "It is well known that the manufacture of firearms, of all descriptions, has long been in a very unsatisfactory state in this country, owing mainly to the disinclination of the Birmingham manufacturers to avail themselves of any of those mechanical inventions so largely resorted to by the manufacturers of the United States. At the present time, when the Birmingham gunsmiths are performing nearly all their work by the hands of skilled and expensive workmen, Colonel Colt's revolving pistols and rifles are made at his establishment in London with greater perfection, almost entirely by self-acting machines, attended by women and boys. The Government, aware of this great difference, have resolved to extend their establishment at Enfield, so as to be able to turn out 100,000 Minié rifles per annum, and have entrusted the fitting up of the engines and millwright works to Messrs. Fairbairn and Sons, of Manchester, while, as is already generally known, they have employed Mr. Joseph Whitworth to make (in conjunction, we believe, with Mr. Westley Richards, the eminent London gunsmith), a series of very elaborate experiments on the best form and most efficient means of construction of military rifles. These experiments are now proceeding in a very satisfactory manner in the building which has been erected for that purpose in Rusholme; and we have no doubt that some very important improvements in the construction of this most important weapon will result from them. In addition to these things, Messrs. Sharp, Stewart, and Co., of the Atlas Works, have contracted to make some mortars of large size. Messrs. Platt, Brothers, and Co., of Oldham, after having completed some machinery for the more perfect manufacture of Lancaster shells, are now engaged, as are also, we believe, Messrs. Benjamin Hick and Son, of Bolton, in the casting of shot and shells. Messrs. W. Higgins and Son, of Salford, are also engaged in casting shells, and particularly Shrapnell shells of a new and improved construction. Of the plans of Mr. Nasmyth, of Patricroft, for constructing wrought-iron guns of enormous calibre and power, the public have already heard a good deal; and we believe that Mr. Nasmyth is now proceeding in his novel undertaking, though very properly but little is allowed to transpire as to his progress. Altogether, therefore, it will be seen that Manchester and its neighbourhood are contributing largely to the means and appliances for carrying on war with effect, and we trust that their contributions will have a full share in conquering that peace, which we are much more likely to obtain from our own success in arms than from the moderation of the Russian government."

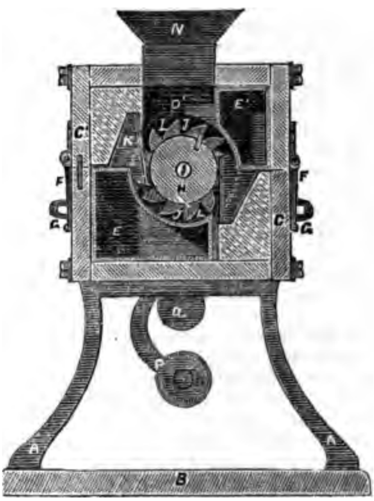
LYON'S PATENT MINCING MACHINE.

MR. A. LYON, of Finsbury, patented, on the 15th of December, 1854, an invention which consists in forming the top and bottom of the case of machines generally known as "sausage-machines" hollow, or in fitting them with water-tight cases provided with suitable inlet and outlet passages, or with one passage only to serve for both, for the purpose of containing hot water, or for admitting steam, the object being to keep the meat and other substances warm while going through the

machine. He forms the barrel or drum of white metal, and casts on one end a wheel or shield, to keep the substances from the axis on which the barrel revolves, while on the opposite end he casts three or more portions or threads of a screw, in order to force the substances from the machine after they have been cut. Instead of providing the upper part of the box or case with a hinge at one side, and a hasp at the other, he makes it with two hasps, so that it can be readily removed when required for the purpose of cleaning or otherwise. The machine is fixed on a convenient stand by means of thumb-screws inserted in the bottom of it, and passing through slots in the top of the stand, being secured by turning the heads of the screws at an angle to the slots.

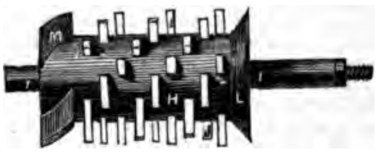
Fig. 1 represents a section of a machine constructed according to Mr. Lyon's invention. A A is a stand formed of metal, and

Fig. 1.



cast in a piece with the sole-plate, B, which is of considerable thickness, in order to give steadiness to the machine when being worked. C C′ is a box or case, which is made in two halves. The part, C, is secured to the frame or stand, A, by means of the screws, *a a*, which are passed through slots in the upper portion thereof, having their heads then turned at an angle to prevent their slipping out of the slots. D D′ are water-tight cases, which are fitted into and secured to the boxes, C C′, and contain hot water, steam, or other heating medium for keeping the contents of the machine warm. E E′ are *short pipes which communicate* with the *interior of the cases,* and which are for introducing and withdrawing the heating liquid into and from them; they are closed by the screws, *b b*. F F are hasps, which are hinged to the upper case, C′, the lower ends thereof being slotted out to fit over the staples, G G, upon the lower case, C. H (figs. 1 and 2)

Fig. 2.



is the barrel or drum fitted upon the spindle, I, and turning in sockets between the cases, C C′. This barrel is studded spirally with teeth, J J, which work between the stationary knives, K. L is a disc or shield upon the drum, for preventing the meat or other substances from falling on to the axis of the drum while being cut, and M M are portions of a screw upon the opposite end of the drum, for forcing out the substances when cut. N is a feed-hopper, and the machine is furnished with a spout, into which the cut substances are forced from the case.

REWARDS OF SCIENTIFIC MERIT.

At the Anniversary Dinner of the Society of Arts, which we have noticed on another page, Professor Owen, after alluding feelingly to the provisions made in mediæval times for the due dignity of such master minds as might attain the high posts at our universities, proceeded to speak as follows: "The human intellect," said he, "has since extended its conquests over a wider range and different fields; more congenial, perhaps, to its true aims and powers than the scholastical, logical, and theological studies which represented science before Galileo and Bacon. Has England continued to cherish and foster in the same spirit the new and fruitful natural sciences, as she honoured herself and manifested her wisdom by doing in relation to the older forms of human knowledge? What, for instance, at the present period of her unexampled wealth—due mainly to the application of the abstract discoveries of science—what is the national relation of her Faraday? What is my own? Are we labouring, lecturing, in national institutions, in fixed positions, absolutely exempt from the annoyance of individual interference or caprice, in the peace-giving certitude of the continuance of hardly-earned emoluments, with the cheering conviction of a suitable retiring provision when the wearied brain begins to fail in its wonted and expected efforts? As working men in our

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line, with bread to earn by the work we do, England owns us not; she ignores us in the sense in which she recognized and provided for her mediæval teachers. We are merely the servants of particular chartered bodies. As a comparative anatomist, indeed, I deem myself fortunate among my fellow-workers in the place I hold; but it needs only that a majority of the Council of the College of Surgeons should so will and vote it, and after nigh thirty years' service I must begin the world afresh. My masters are irresponsible, or only remotely responsible, to public opinion. Hitherto England has devised no other or better position for the man whom she may delight to honour by calling 'her Cuvier,' than the curatorship of a museum belonging to one section of the medical profession. In my own case, indeed, the Council of the Surgeon's College have done me the honour to re-elect me annually for some years past to a professorship not previously held by the curator of their museum. But this position has none of that fixedness and independence which my brother professors of the same science on the Continent enjoy. When the First Consul of France revised the appointments and position of the professors in the national establishment of the Garden of Plants at Paris, the salary which he attached to the chair of comparative anatomy, with which the secretaryship of the sciences was then associated, the appointment, I say, was on such a scale, that the finance minister remonstrated. 'Cuvier,' replied Napoleon, 'has a position in science; it is for the honour of France that he should be able to maintain that position towards the foreign *savans* who may visit Paris.' Great is the pleasure with which I can state, that the short-comings of our national arrangements for analogous cases have been well understood by the most illustrious personages and individuals of the State, who have generously endeavoured to remedy and compensate for them. The noble Lord at the head of foreign affairs, in the most handsome terms, gave my son a clerkship in his office. Sir Robert Peel in assigning to me, a short time before his lamented death, a pension of £200 a-year, well appreciated the acceptability of such a provision in the exemption from anxiety flowing therefrom. I shall never cease to gratefully cherish the memory of the wise and benevolent statesman who created for me the satisfaction of feeling that, whatever might possibly cause a termination of my present appointments, I do not thereby fall into utter destitution. Her most gracious Majesty, measuring my humble merits by the standard of her own greatness of mind, was pleased to offer me, as a residence, the mansion of the late *King of Hanover*, at Kew. On my respectfully representing to her illustrious consort, your gifted and philosophic president, the disproportion of my means to the fruition of that royal gift, he was pleased to suggest the assignment to my use of a beautiful cottage, in which the most healthful and delightful hours of my life have been spent, and which daily renews a grateful sense of the happiness and privilege we enjoy in the benign reign of Victoria."

ON THE PERIODICAL VARIATIONS OF TERRESTRIAL MAGNETISM.

BY A. SECCHI,

*Director of the Observatory of the Collegio Romano.**

To consider the whole complexity of magnetic perturbations as a mere meteorological effect, appears to be assigning to them a cause not adequate to the effect. The fact mentioned above, that the maxima of the perturbations at Hobarton succeed each other with the same retardation as the other magnetic phases, is one which cannot be explained either by the retardation of the effect of temperatures, or by the condensation of vapour. We cannot conceive how these should account for the general retardation of one hour. It is then a purely magnetic fact, the explanation of which depends on that of the physical cause of solar and terrestrial magnetism. The same may be said of the greater perturbations at the epochs of the equinoxes, which certainly bear no relation to the state of the atmosphere or to the solar heat. Colonel Sabine makes the acute observation, that the coincidence of the solar spots with the maximum of the perturbations demands a cosmical cause, depending on that body.†

We may be permitted to refer here to the hypothesis of Mairan on the solar atmosphere, and on its relation to the zodiacal light and the aurora borealis, and therefore to the magnetic perturbations. We are far from admitting the theory as proved, since it appears impossible to admit that the solar atmosphere extends so far as half the radius of the orbit of Mercury,‡ whence it is rather

* This article forms the conclusion of a paper of M. Secchi's, recently contributed to the *Phil. Mag.* by Mr. Archibald Smith.

† It may be said, that as the spots are apertures in the atmosphere of the sun, they give freer passage to the magnetic action of the solar nucleus.

‡ See Mairan's Works, p. 199, in which for the months of the year the following numbers are given relative to the frequency of the aurora, beginning with January,—21, 27, 22, 12, 1, 5, 7, 9, 34, 70, 26, 15.—*Mairan sur l'Aurore Boreale, suite des Mémoires de l'Ac. des Sciences*, 1731.

to be inferred that the zodiacal light depends on a nebulous ring circulating round the sun between Venus and the earth.

But whatever hypothesis be adopted, there are various coincidences which may be deserving of regard. Mairan had, even in his day, remarked the greater frequency of the aurora borealis at the equinoxes,* the epochs at which the zodiacal light is most visible. Neither had the relation between the greater frequency of the aurora borealis and the epochs of the greater solar spots escaped him, a relation already remarked by Cassini.†

The paucity of observations at that time permitted suggestions to be made which have been since proved to be groundless; but in general such coincidences are worthy of consideration. Modern observations of the eclipses of the sun, of the protuberances and of the corona, as also of the spots, of the temperature of various parts of the disc, as well as photographic impressions, have placed beyond doubt the existence of the solar atmosphere even beyond the zodiacal light.‡ In reading Mairan, one cannot help seeing the serious difficulty which he finds in explaining why the auroras have their maximum at the equinoxes, and not at the epochs at which the earth passes through the nodes of the solar atmosphere; but do we truly know the place of the nodes of the zodiacal light? He assumes that they are the same as those of the solar equator, but this is not proved; and if the zodiacal light constitutes a ring, it might well be otherwise. On the magnetic hypothesis, the greater frequency of the aurora at the epochs of the equinoxes would have relation to the position of the poles of the sun with reference to the earth, these poles being in fact more directed towards the earth at the equinoxes, and being more or less oblique to it at other times.

Those who hold the theory of the production of electricity by vapours, may say that these become rarefied in the morning and condensed in the evening; and hence may arise opposite electric states, the fluid passing in the morning from the earth to the atmosphere, and in the evening from the atmosphere to the earth. This may be true; but why should this condensation always take place at nine in the evening? The hygrometric curves of the different months show at all events a variation in the hour of maximum according to the seasons.

A hypothesis, however, can be found which would conciliate the various facts, viz., that atmospheric changes may generate electricity, but that the direction of the current, which of itself would be indeterminate, may be determined by the magnetic action of the sun. But to expand this further into a hypothesis would be at present premature. We will only say that it is not improbable that the earth is subject to the magnetic action of the sun in a manner unknown to us; but now that magnetic phænomena are developing themselves under so many aspects, we may hope that the explanation of these mysterious actions will soon be found, not only magnetism, but diamagnetism also may co-operate, and still more the induced currents which exist in bodies of every kind. Two things only I wish to notice. First, the value assigned by Gauss to the magnetism of a cubic meter of the earth,* is such as to make one believe that the whole mass of the earth is really magnetic, and that this force results not only from ferruginous substances, but from the whole globe itself. He proves, in fact, that the eighth part of a cubic metre of the earth has a magnetic moment equal to that which is possessed by a bar of steel 1 lb. in weight and 30 centims. in length, magnetized to saturation. He justly observes, that such a result must surprise physicists, and that it would require 8464 trillions of such bars to represent in space the magnetic force of the earth! The other is, that magnetism may act upon bodies in a manner quite surprising, and of which we are very far from forming an idea before seeing its effects. The marvellous† expe-

* *Vide* Humboldt, vol.iii.p.413,Sabine's edition.

† *Vide* Humboldt's "Cosmos," vol. iii. *et seq.*, Sabine's edition.

‡ In the past winter I have been engaged in taking the solar disc on plates of glass, in order thus to confirm the discovery made in 1852, of the difference of temperature in different parts of the disc. The impressions obtained were stronger in the centre than at the edges; but I have abstained from publication, because I do not consider this proof as very decisive. In fact, the image cannot have an equal intensity in every part of the field of the telescope, on account of the obliquity of the different pencils of rays which compose it. It is otherwise in the thermo-electric experiments where the pile remains invariable in regard to the axis of the lens, and therefore this obliquity hardly exists, or is equal for all points of the disc from which rays fall upon it. I think it right to say this, because I find photographic experiments recently brought forward as proofs of the smaller intensity of the light at the edges than at the centre, and I think it probable that they may be subject *to the exceptions which I found* in my own.

* General Theory of Terrestrial Magnetism, Taylor's Scientific Memoirs, vol. ii., part 6, art. 5, page 225, No. 31.

† I owe it to the kindness of R. P. Palladini, Professor in the College at Naples, that I was a witness of this magnificent experiment, performed with the apparatus with which he has provided the physical cabinet of that college. In truth, one cannot but be surprised at seeing a body rotating with such velocity, stop at the instant at which the circuit is completed, as if it had encountered an invisible obstacle. The torsion given to the thread was sufficient to make the cube rotate with such velocity as to appear a cylinder, and yet on completing the circuit it stopped instantly, and

riment performed with Ruhmkorff's apparatus, in which a cube of brass, 2 centims. in the side, rotating with the greatest rapidity is struck motionless, if I may use the expression, by an invisible force at the moment of the completion of the circuit of the great electrical magnet between the poles of which it is situated, and without being drawn to one side or the other, remains there fixed, in spite of the powerful torsion of the wire which tends to cause it to rotate —and resumes its rapid motion when the current ceases—proves that non-magnetic bodies in motion may, under the influence of a magnet, give rise to phænomena of the most mysterious nature. An action of this kind must take place between the earth and the sun, and thus perhaps may be explained some of those anomalies which still present no small difficulties to every theory which is proposed.

The object of this memoir having been to co-ordinate the laws of the diurnal motion of the needle, we leave to another opportunity the discussion of its secular variations, as well as of the lunar action which appears to Colonel Sabine to have been placed beyond doubt; and perhaps the time is not distant when the diurnal magnetic variations will have been subjected to laws depending only on the most simple relation of distance and angle between two magnets.

The matters discussed at length in this memoir may be summed up in the following propositions:—

1. The action of the sun upon the needle is opposite, according as the sun is north or south of the equator.

2. The action of the sun on the declination-needle has a period, in part but not entirely, analogous to that of the temperature and of the annual and diurnal meteorological changes.

3. The periods of the horizontal and vertical components, following the law of the geographical latitude, and occurring at hours wholly different from the variations of temperature, show a different origin from these. Therefore, if the coincidence in time, in the variations of the temperature, and declination, have contributed to the belief of the existence between these two of a mutual relation of cause and effect, the study of the other components makes this coincidence disappear, and therefore destroys every foundation of the hypothesis.

4. All the phænomena hitherto known of the diurnal magnetic variations may be explained by supposing that the sun acts upon the earth as a very powerful magnet at a great distance.

when the current was sufficiently strong, it stopped without the angles being directed to the poles of the magnet (as is usual in the case of weak currents). The explanation of this fact is involved in the phænomena of the magnetism of rotation; but I wished to adduce it as an instance of how a force already *known may act in certain circumstances in a new and astonishing manner.*

THE PARIS EXHIBITION.

At a meeting of the British jurors recently held at No. 14, Rue du Cirque, Paris, Lord Ashburton in the chair: present the Marquis of Hertford, Lord Shelburne, Lord Elcho, Sir George Clerk, Sir Charles Barry, R.A., Sir Joseph Olliffe, Messrs. Addington, Amos, Dr. Arnott, T. Bazley, Bird, Butterfield, Alderman Carter, Cockerell, R.A., W. Crum, T. De la Rue, Warren De la Rue, Evelyn Denison, M.P., W. Fairbairn, W. Felkin, T. F. Gibson, W. J. Hamilton, President of the Geological Society J. Hartley, C. Knight, J. MacAdam, jun., D. Maclise, R.A., C. Marshall, R.A., J. H. Robinson, Dr. Royle, J. Scott Russell, Warrington Smythe, Professor Tyndal, Professor Willis, Professor Wilson, and T. Winkworth, it was resolved unanimously:

"That it is desirable an early intimation should be given to the British public of the great excellence of the Exhibition, and of its marked advance in the objects exhibited over that of 1851. That it is eminently worthy the attention of artists, of manufacturers and their workmen and of all classes in the United Kingdom."

A Lecture on Respiration. By Thomas Hopley.

This is the sixth of a series of simple lectures intended to promote the Education of Man, the remainder of which treat of the exercise of the body, diet, sleep, clothing, cleanliness, &c. The writer has been for some years engaged in preparing for delivery in London, a series of plain and simple lectures, his object being, "*first*, to urge upon the serious consideration of such of the upper and middle classes of society as will favour him with a hearing, the fearful effects of certain errors existing in the systems under which their children are for the most part trained—errors requiring but determination among heads of families to be at once eradicated; and *secondly*, to show to all whom he may have the power to address, something of the physical and mental condition of the national poor, who can never be rescued from the sin and misery which are at present forced upon them, save by the energetic strivings of large bodies of men and women who will work, not for the sake of pay or human applause, but through love of God and their neighbour."

Mr. Hopley's lectures have the unusual merit of containing an accurate summary of the facts which have been established in relation to the subjects of which he treats,

while the author writes with an earnestness which raises him far above a certain throng of presumptuous men, who have recently pressed themselves forward from their natural obscurity into public notice, upon the platforms of our mechanics' and other similar institutions, and who appear to use these places merely as a ready means of acquiring a satisfactory livelihood.

We give the following extracts to illustrate the style of the author:

CONTAMINATIONS OF THE ATMOSPHERE OF LONDON.

"Dr. Playfair estimates the amount of gases annually evolved from the decomposition of 1,117 corpses per acre, at 'not less than 55,261 cubic feet.' Now, since about 52,000 burials have, during a lengthened series of years been annually taking place in the metropolis, it follows from this ratio that *at least two million, five hundred and seventy-two thousand, five hundred and eighty cubic feet* of gases have for many years been yearly emitted, and, what is worse, must for years to come be yearly emitted, from the metropolitan graveyards!

"The drains, sewers, and cesspools of London constitute what may well be termed an underground city of filth; and so constructed that probably three-fourths of the entire refuse of the metropolis are constantly steaming beneath the feet of its inhabitants; the remaining fourth is sent out to pollute the Thames. Some notion may be formed of the size of this underground city, when we consider that it constitutes 'an evaporating surface which might be represented by a canal thirty feet wide, and forty miles long; or it may be said to be equal to 145½ acres of sewer, or cesspool surface,' gathered together in the heart of London. It would be extremely difficult to calculate the amount of poison arising from this vast area of putridity; but surely we are far below the mark when we estimate it at thrice the volume arising from the graveyards: yet, even from this low estimate, it would appear that no less than *ten million, two hundred and ninety thousand, three hundred and twenty cubic feet* of gases are evolved every year from the sewerage, cesspools, and burial grounds of London . . . . Whatever portion of these gases is not absorbed by the earth—earth already surcharged with the accumulations of centuries—and whatever part does not mix with and contaminate the water, must be emitted into the atmosphere, respired by the inhabitants of London."

EFFECTS OF BREATHING AN IMPURE ATMOSPHERE.

"In about 2½ minutes, all the blood contained in the human system, amounting in the adult to *nearly three gallons*, traverses the respiratory surface. Every one, then, who breathes an impure atmosphere 2½ minutes, has every particle of his blood acted on by the vitiating air. Every particle has become less vital—less capable of repairing structures, or of carrying on functions: and the longer such air is respired, the more impure it becomes, and the more corrupted grows the blood. Permit me to repeat, that after breathing for 2½ minutes, an atmosphere incapable of properly oxygenating the fluids which are traversing the lungs, every drop of blood in the human being is more or less *poisoned*; and in 2½ minutes more, every, the minutest part of all man's fine-wrought organs has been visited and acted upon by this poisoned fluid — the tender, delicate eye, the wakeful ear, the sensitive nerves, the heart, the brain; together with the skin, the muscles, the bones throughout their structure, in short, the entire being. There is not a point in the human frame but has been traversed by vitiated blood — not a point but must have suffered injury."

We will conclude this notice with the words of the *Westminster Review*, which says, "We wish Mr. Hopley all success, but we warn him not to expect it. This is an utterly idolatrous age and nation—a people which listens to the voice of the living God thundering from the Sinai of Science, and straightway forgets all that it has heard, to grovel in its own superstitions; to worship the golden calf of tradition; to pray and fast where it should work and obey, and as of old to sacrifice its children to its theological Baal."

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

SIR,—I now continue my examination of the "Conclusions" to which the Board of Health have arrived with reference to the so-called "Consumption of *Smoke*," meaning the combustion of the *gas* generated from coal in furnaces, and without smoke.

Conclusion 7. "That successful modes of preventing smoke, if there be proper *boiler surface*, may be adopted without the infringement of any patent right, the methods in question not having been patented, or the patents having expired."

With the exception of the words "if there be proper boiler surface," this conclusion is correct. It is true there have been numerous patents and contrivances for effecting the *consumption of smoke*, all of which necessarily were failures, as smoke cannot be

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consumed. There is, however, one mode, and one only, for effecting the *combustion of the gas*, whether generated in the furnace or the retort, namely, the bringing it into immediate contact with the proper quantity of air in the proper manner. This mode was patented by me in 1839. That patent being now expired, it has been introduced (but without acknowledgment) into many new patents; among these may be mentioned Woodcock's, Prideaux's, Parker's, and many others.

Conclusion 8. "That notwithstanding the obvious advantages of perfecting the combustion of fuel, such is the *indisposition of practical men to depart from the beaten track*, that nothing but the *force of law* is likely to ensure the care and attention necessary to protect the public, &c."

Nothing can be more correct than this conclusion. This "indisposition of practical men" arises from what Mr. Houldsworth (see his letter at page 16 of the Report of the Board of Health) considers as the "ignorance and prejudice" of the owners of furnaces. Ignorance of the principles which govern the laws of combustion, and prejudice, the accompaniment of such ignorance.

Manufacturers, and practical men in general, by neglecting to obtain the requisite information (perhaps because it involves something of chemical details), become thus dependent on others, and are ever at the mercy of their own servants and stokers, who have no interest to satisfy beyond that of saving their own labour. Whatever interferes with the easiest and laziest mode of managing a furnace, is sure to be condemned by the stoker, his employer being unable to detect the imposition. Now, the charging and managing a furnace, or of introducing the air, by which alone combustion can be effected, is as undeniably a part of *practical chemistry* as any of those numerous and minute details which fill the useful volume of "Faraday's Manipulations."

Conclusion 9. "That though the absolute prohibition of smoke could not be enforced without compelling most of the owners of furnaces to incur very heavy expenses, its reduction to a very small amount may be effected with comparative ease, &c."

The conclusion, with reference to the incurring "very heavy expenses," is here gratuitous and unwarranted. In truth, and speaking the result of great experience, it may be stated that the having "incurred very heavy expenses" is demonstrative evidence that the patentee of the invention applied was either ignorant of the simple process of nature in effecting combustion, and the facility with which that process can be carried out, or that the application of such costly or complicated apparatus as should involve "very heavy expenses," was mainly intended to give a colour to, or justify a high and commensurate charge and profit to the patentee.

Conclusion 10. "That the enforcement of smoke regulations can be most easily and quickly effected by the appointment of constables to keep a regular and constant watch upon all chimneys liable to emit much smoke; and that the prevention of smoke will be more quickly and certainly effected by *constant supervision and immediate information* of any breach of the regulations, than by heavy penalties irregularly imposed."

This is the soundest and most practically useful of the twelve conclusions to which the Board of Health have arrived. The appointment of "constables to keep a constant watch," is absolutely essential to the enforcement of regulations; while "*constant supervision and information*" are the only effective checks on that neglect and recurrence of mismanagement by which the evil would be continued. The authorities of Liverpool have wisely, though tardily, adopted this principle. They have appointed an official "*inspector of smoke nuisances.*" The result of even a few weeks of such supervision and "gentle legislative pressure," as Mr. Houldsworth expresses it, is too remarkable and undeniable to be questioned. On this head, and after many years of extensive practice, I can certify to the necessity of this constant and watchful supervision; nothing having thrown more difficulty in my way than the interested obstinacy of engineers and firemen, in adhering to their own lazy mode of managing the furnaces, even of those employed in the numerous steam vessels under my own control. When to this is added the "indisposition of practical men" (the makers of boilers and furnaces) to depart from the beaten track, it can no longer be a matter of surprise that so little has been done in "perfecting the combustion of fuel." The mere stokers, and particularly in steam vessels, where they must necessarily be left to themselves, have it in their power to give apparent favourable results to their own modes and mismanagement, and plausibly to show them none other can supply the

engine with the necessary quantity or pressure of steam.

Conclusion 11. "That great facility in the prevention of smoke would be afforded by the publications and descriptions of patented and other inventions for the prevention of smoke, by which those interested could be informed what they could and could not do in this matter, without infringing upon any patent right."

This is as impractical and useless a conclusion as the preceding one is practical and effective. Nothing, indeed, could be more certain of leading the public astray than the descriptions of even the patentees of their own respective plans. On this head more will be said hereafter.

Conclusion 12. "That great facility would also be afforded by the appointment of officers, specially qualified, and not connected with any patentee or manufacturer of boilers of furnaces, to superintend the police officers employed to suppress the nuisance of smoke, and to advise owners of furnaces how best to comply with the provisions of the law, and to report upon cases of its infringement."

This is a valuable suggestion. The difficulty, however, of carrying it out would, it is feared, be too great to render it generally available. The magistrate, in the discharge of his duty, is often unequal to the task of even appreciating the worth or truthfulness of the statements of the offending party; much less is he capable of offering advice, or suggesting a remedy, whether chemical or practical. The Admiralty judge finds it necessary to have nautical men, as aids, or assessors, before he is qualified to decide on nautical distinctions. The civil judge, on the trial of offences in smoke-nuisance cases, should, in like manner, have an assessor; but he should be a chemical professor, seeing that the offence is as attributable to a breach of chemical laws or practice, as much as the improper steering a ship or mismanagement of sails would be a breach of nautical law or practice. Under the existing law, however, the magistrate is not called on for such strictly professional knowledge. With your permission, Sir, I propose hereafter to examine the general bearing and details of this important communication from the General Board of Health.

I am, Sir, yours, &c.,
C. W. WILLIAMS.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

LYON, ARTHUR, of Windmill-street, Finsbury, Middlesex, sausage-machine manufacturer. *Improvements in machines for reducing or mincing meat and other solid edible substances.* Patent dated December 15, 1854. (No. 2642.)

A full description of Mr. Lyon's improved machine is given on page 31 of this Number.

TURNER, LUKE, of the firm of Hodges and Turner, of Leicester, manufacturers. *An improvement in weaving elastic fabrics.* Patent dated December 15, 1854. (No. 2643.)

Claim.—The method of operating the elastic threads alone, and this whether by the ordinary loom for weaving elastic fabrics, or by the adaptation thereto, in combination with two or more tiers of shuttles carrying each a weft of a different colour or material, of the Jacquard arrangement so as to lift or bring the required number of elastic threads to the surface, in such manner that when the shuttles are thrown between the sheds the required pattern is produced.

ARCHER, FRANCIS, of Bishopsgate-street, London, and WILLIAM PAPINEAU, of Stratford, Essex, manufacturing chemist. *Improvements in distilling peaty, schistose, bituminous, and vegetable matters.* Patent dated December 15, 1854. (No. 2644.)

Within retorts, placed horizontal, or nearly so, rakes are moved from end to end by an endless chain or otherwise, in such manner as to move the peaty, schistose, bituminous, or vegetable matter from the feeding to the discharging end of the retorts, where there are outlets for the passage off to suitable condensers of the products distilled.

ADAMS, ROBERT, of King William-street, London. *Improvements in fire-arms called revolvers.* Patent dated December 15, 1854. (No. 2645.)

These improvements consist—1. In the application of a bolt to fasten and retain the movable axis on which the short barrels revolve, such bolt being moved into and from a recess in the movable axis by being formed with an inclined thread or screw, so that by moving an arm or instrument fixed to the bolt partly round, it securely bolts the movable axis. 2. In the use of a bolt to fasten the short barrels in such position that if the hammer is moved back it will not strike either of the nipples. 3. In constructing a peculiar lever ramrod.

STRONG, EDWARD, of Carstairs, Lanark, North Britain, engineer. *Improvements in removing and replacing the wheels and axles of locomotive engines and other rolling stock of*

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railways. Patent dated December 15, 1854. (No. 2646.)

According to one modification of this invention the inventor's arrangement is carried out by fitting up the repairing-shop, or other locality where the operation of removing and replacing the wheels is to take place, with a screw-lifting and lowering frame set in an excavation beneath the level of the railway, so that the wheels and axles may be removed and replaced by descent and ascent from and to the engine or carriage, without disturbing the main body of the engine or carriage itself.

HEWITT, DANIEL CHANDLER, of Richmond, Surrey, professor of music. *Improvements in the construction of pianofortes.* Patent dated December 16, 1854. (No. 2647.)

Claims.—1. Applying pianoforte-strings to walls or fixed partitions as a substitute for the strong portable wooden frames and metal bracings at present employed for taking the strain of such strings. 2. The application to pianofortes generally of a certain lever arrangement for holding the strings at tension and facilitating the tuning of the same. 3. Arranging the strings of the several notes in different planes. 4. A method of raising the level of the bearing point of the keys.

LIVSEY, PETER JOEL, and WILLIAM WEILD, both of Manchester, Lancaster, engineers. *Improvements in cartridges and projectiles, and in the construction, mounting, and working of ordnance.* Patent dated December 16, 1854. (No. 2648.)

These improvements in cartridges relate principally to such as are intended for the heavy class of ordnance, and consist in providing each with a tube placed in its centre, by means of which the firing is conveyed to any point of the charge. The end of the tube projects from the cartridge, and has a covering cap fixed upon it until it is required to be inserted into the gun, when the covering cap is removed, and replaced by a percussion cap. The invention also comprises a method of constructing large projectiles on the Minié principle—a method of forming cannon of rings or annular sections of metal bolted or otherwise fastened together—a method of building up guns in position—a method of mounting guns on a sort of turntable—and an arrangement of machinery for working the guns.

SYKES, JOHN, of Huddersfield, York, machine-maker. *Improvements in piecing-machines, a part of which improvements are applicable to other similar purposes.* Patent dated December 16, 1854. (No. 2649.)

This invention comprises a general arrangement of machinery the principal feature of which consists in a "peculiar mode of regulating the traversing motion of the friction drum compatible with the increasing size of the bobbin, so that one lap may be wound by the side of the other," and this portion of the invention is applicable to other machinery in which the traversing motion requires to be regulated to accommodate it to the increasing size of the bobbin.

FRIEND, MATTHEW CURLING, of Ashburnham-grove, Greenwich, lieutenant in the Royal Navy, and WILLIAM BROWNING, of Minories, Middlesex, philosophical instrument maker. *An apparatus for determining the magnetic aberrations occasioned by local attraction.* Patent dated December 16, 1854. (No. 2652.)

A full description of this invention was given on page 610 of No. 1664, vol. 62.

FENTON, JAMES, of Low Moor, York, civil engineer. *Improvements in the manufacture of axles, piston-rods, and shafts, girders, and other like articles.* Patent dated December 16, 1854. (No. 2653.)

Claim.—A mode of manufacturing axles, piston-rods, &c., by rolling up or coiling a plate of iron into a compact roll or coil, next bringing this roll or coil to a welding heat, and then drawing it to the required shape under a hammer, or by passing it between rollers, or by a combination of hammering and rolling processes.

CHANCE, ROBERT LUCAS, of Birmingham. *An improvement in the manufacture of glass.* Patent dated December 16, 1854. (No. 2655.)

This invention consists in causing the fine slack used to be washed before employing it in glass-melting furnaces.

MARTIN, JULIANA, of Soho-square, London. *A safety-apparatus for effectually cleaning windows from the inside of a room.* Patent dated December 16, 1854. (No. 2657.)

This safety apparatus consists of a light wooden rod, to the upper end of which is fitted a brass or other metal elbow terminating in a screw upon which is screwed a rectangular piece of wood to which a cleaning leather or cork is tied.

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *An improved life-car or buoy.* (A communication.) Patent dated December 16, 1854. (No. 2660.)

This car or buoy is composed of a series of cylinders connected together by rods or bolts, each cylinder being divided by watertight partitions into several compartments.

HARTLEY, WILLIAM, of Bury Lancaster, engineer. *Improvements in safety-valves for steam boilers and steam engines.* Patent dated December 16, 1854. (No. 2662.)

This invention comprises—"1. The employment of two valves or pistons, the one of superior area and keeping the other closed by steam pressure, until an equilibrium is

established by admitting steam to either side of the former; also, the use of a small supplementary loaded valve, for the purpose of admitting steam to another valve thereby rendering it in a state of equilibrium. 2. As applied to motive power engines, the employment of two pistons of unequal areas, on either side of the larger of which an equilibrium is established alternately with the steam pressure on one side."

SECKENDORFF, ROBERT VON, of St. Helen's, Lancaster, manufacturing chemist. *Improvements in concentrating and distilling sulphuric acid.* Patent dated December 18, 1854. (No. 2663.)

Claims.—1. The substitution of iron vessels or apparatus instead of lead, glass, and platinum hitherto employed in the concentration and distillation of sulphuric acid. 2. Adding to the crude sulphuric acid sulphate of lead, sulphate of lime, and common sand, or other suitable material which will not decompose sulphuric acid at a high temperature.

WHELE, EDWIN, of Birmingham, Warwick. *Improvements in oil and other lamps.* Patent dated December 18, 1854. (No. 2664.)

This invention comprises "means of adjusting the wick in the burner by a rod passing up the centre, and by placing the wick between wheels or rollers; and the winding up of the valve or plunger of moderator lamps, by a pulley and chain. Also a mode of forming the casing of such lamps to open as described, and the use of iron or tinned racks and flowpipes, and the absence of all brass parts or fittings in contact with the oil," &c.

HART, THOMAS, of George-street, Glasgow, foreman to Messrs. David and John Anderson, manufacturers. *Improvements in Jacquard apparatus for weaving.* Patent dated December 18, 1854. (No. 2665.)

This invention relates to the weaving of tartan or other chequered fabrics, and consists in improvements in the manner of constructing and working a Jacquard apparatus so as to more conveniently regulate the shifting of the shuttle boxes, these improvements being to a certain extent applicable to Jacquard apparatus when used for any other purpose.

MELSENS, LOUIS HENRI FREDERIC, of Brussels, Belgium, professor of chemistry and natural philosophy. *Improved processes of saponification.* Patent dated December 18, 1854. (No. 2666.)

Claims.—1. The decomposing of fatty bodies into fatty acids and glycerine without the use of any other reagent than common or acidulated water at a pressure differing slightly from the pressure usually employed. 2. Transforming, by means of a single operation, crude tallow or any fatty body into fatty acids as described.

CUNNINGHAM, JAMES, of West Arthurlie, Renfrew, North Britain, bleacher. *Improvements in starching textile fabrics.* Patent dated December 18, 1854. (No. 2667.)

This invention consists in a mode of starching textile fabrics, by passing them in contact with a roller, or rotatory distributor, supplied in any convenient way with starch, and made to revolve at a greater surface velocity than that of the fabric starched.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the extracting tannic acid from leather, and in preparing the leather for the manufacture of glue.* (A communication.) Patent dated December 18, 1854. (No. 2668.)

In carrying out this invention, the leather having been first chopped in small pieces is thoroughly washed, to remove the dirt and a part of the colouring matters, then placed in suitable cisterns or vats, and digested in a caustic alkali, either of ammonia, potash, or soda. It is afterwards subjected to pressure or acted upon in a centrifugal machine, and again immersed in a caustic alkali. The tannic acid being thus entirely removed, the scraps of leather are well washed in pure water to remove all traces of the soda, and are then digested in dilute acid for about twenty-four hours in order to remove the colouring and earthy matters. They are next immersed in a weak solution of carbonate of soda for the purpose of neutralizing any trace of acid that may remain, and, when again well washed, are ready to be converted into glue by the usual process.

PRITCHARD, JAMES, of Portsea, Hampshire. *Certain improvements in the construction of screw propellers.* Patent dated December 18, 1854. (No. 2669.)

Claims.—1. Cutting out or removing a section or portion of each blade of screw propellers, and bringing the blade down again upon the axis of the propeller. 2. Giving a circular form to the front and back edges of propeller blades.

FAVEL, AUGUSTE FRANÇOIS JOSEPH, of Paris, gold beater. *A new machine for beating precious metals, applicable to leather and to forging.* Patent dated December 19, 1854. (No. 2670.)

The inventor describes a machine furnished with an arrangement for moving the anvil or mould, of which machine we shall probably give a description hereafter.

DREAPER, WILLIAM PORTER, of Bold-street, Liverpool, Lancaster, pianoforte manufacturer. *The improvement of the manufacture of pianofortes.* Patent dated December 19, 1854. (No. 2671.)

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This invention has for its object the provision of means for counteracting the pressure caused by strings on the sound boards of pianofortes, and consists in the application of certain compensation bars and generators of sound to the ordinary sound boards and bars of pianofortes.

FALGUIÈRE, JEAN BAPTISTE, engineer, of Marseilles, French Empire. *Certain improvements in apparatus and machinery for propelling boats and vessels on water.* Patent dated December 19, 1854. (No. 2672.)

This invention consists of an arrangement of feathering propellers, and of certain direct-acting horizontal engines intended to drive them. The engine consists of a pair of cylinders, the piston rods of which are connected to a common crosshead, from which a rod passes between the two cylinders to a crank on a shaft, which shaft connects together two engines similarly constructed and arranged. To the opposite side of the crosshead a shaft is attached which works through stuffing-boxes fixed in the after part of the vessel and moves the propeller to and fro. The propeller is either mounted directly on the end of the shaft or is connected to it by means of a lever. The propellers are of rectangular or other suitable form, and consist of a frame divided into sections or compartments containing paddles or floats mounted eccentrically on their axes, and acted upon by a rack in such manner that the pressure of the water on them causes them to feather in performing the return stroke whether the vessel is going a-head or a-stern.

AVERY, JOHN, of Essex-street, Middlesex. *Improvements in machinery for cutting metallic bars.* (A communication.) Patent dated December 19, 1854. (No. 2673.)

These improvements consist in providing the face of a revolving hollow shaft with cutters, which, in combination with a stationary cutter in front of them, cut the bar into pieces of any required length.

GLOVER, FREDERICK ROBERT AUGUSTUS, of Bury-street, Westminster, M.A. *Improvements in or applicable to the construction of carriages.* Patent dated December 19, 1854. (No. 2674.)

This invention has reference to the application or adaptation to four-wheeled and other carriages of the springs or spring shafts for which the inventor obtained letters patent dated the 7th of April, 1854 (see *Mechanics' Magazine*, vol. lxi., page 449, No. 1630); and to the modifications of such carriages necessary to be made for the purpose.

BRIGGS, JOSEPH GORTON, of Kingsland, Middlesex, gentleman. *Improvements in the manufacture of fuel.* Patent dated December 19, 1854. (No. 2675.)

Claim.—Wetting or moistening the surfaces of the moulds in which fuel is formed into cakes or blocks, in order to prevent adhesion.

LANGRIDGE, JAMES, and RICHARD LANGRIDGE, of Bristol. *Improvements in stays or corsets.* Patent dated December 19, 1854. (No. 2676.)

This invention is applicable to those classes of stays or corsets wherein double busks are used, and consists of a peculiar combination of instruments for connecting the two parts of a busk together. One part of a busk is formed with two studs, or buttons, and a hook, and the other part with three holes suitable for receiving the buttons and hook.

TUCKER, JOSEPH, of Guinea-street, Bristol, ship builder. *An improvement in the construction of ships for saving persons in case of shipwreck.* Patent dated December 19, 1854. (No. 2677.)

This invention consists in constructing ships with separate and movable poops which may be turned into rafts in cases of necessity.

HUYGENS, R. B., of Holland. *Improvements in ordnance and fire-arms, and in the projectiles to be used therewith.* Patent dated December 20, 1854. (No. 2680.)

This invention consists—1. In forming a longitudinal projection or indentation along the bore of a gun for the purpose of guiding the shot. 2. In making the charge-chamber rather smaller than the diameter of the projectile, and tapering towards the back part of it, in order that the whole force of the powder may be expended in the direction of the projectile's motion, and the strength of the chamber increased by the greater thickness of metal left around it. 3. In a method of obtaining by geometrical diagrams the form of the projectile. 4. In forming the barrels of revolving or repeating fire-arms of such shapes that they shall conveniently receive a projectile of the form of a flattened arrow-head.

PAUL, JOHN, of Manchester, Lancaster, paper stainer. *Improvements in machinery or apparatus for colouring or staining the surfaces of paper, leather, woven fabrics, and similar materials.* Patent dated December 20, 1854. (No. 2681.)

The inventor describes apparatus in which a crank or eccentric, as it revolves, is at the same time caused to traverse laterally by the movement of a screw, and thus communicate to the finishing brushes a compound motion similar to that of the human hand.

MILNER, WILLIAM, of Liverpool, Lancaster, fire-proof safe manufacturer. *Improvements in safes, and other such depositories, and further improvements in the locks*

of the same. Patent dated December 20, 1854. (No. 2684.)

This invention relates to an extension of the principle exhibited in the safes patented by Mr. Milner in 1852, and consists in filling up the open space or spaces usually left between the inner and outer plates forming the door, with wood or other suitable material, leaving only sufficient space for the lock, and the working or passage of the bolts, so that gunpowder may not be introduced as a means of opening the lock.

WHYTOCK, RICHARD, of Edinburgh, and THOMAS PRESTON, of Nottingham. *An improvement in the manufacture of fabrics by twist lace machinery.* Patent dated December 20, 1854. (No. 2686.)

Claim.—The manufacture by twist-lace machines of fabrics "consisting of two warps and one set of bobbing threads, one warp being straight down in the fabrics, and the other warp held thereto in zigzag parallel lines by the bobbin threads."

BOUSFIELD, GEORGE TOMLINSON, of Sussex-place, Loughborough-road, Brixton. *Improvements in machinery for splitting leather.* (A communication.) Patent dated December 20, 1854. (No. 2687.)

The object of this invention is to keep the leather more uniformly and evenly pressed up to the gauge roll, however variable its thickness may be, and it consists—1. In the use of a roll, composed of metallic sections or rings, placed beneath the gauge roll, and performing the office of the spring plate heretofore employed, the sections or rings being forced up by means of springs. 2. In the use of a feed apron, elastic in the direction of its thickness, but not in that of its length.

WALKER, ROBERT, of Glasgow, merchant. *Improvements in telegraphing.* Patent dated December 20, 1854. (No. 2688.)

The object of this invention is to place the means for telegraphic communication with railway stations in the hands of a guard or other person, at every point of the line. "I employ," says the inventor, "a single wire along the line of communication, and connect it with one voltaic battery, or with two batteries, according as it is desired to telegraph from a given position in one direction only, or in both directions. When it is required to signal in one direction only from a given position on the line, I connect the wire with one pole of a battery, the other pole being connected with the earth," and by means of an instrument which he carries with him he then communicates signals, &c.

BELL, GEORGE, of Cannon-street West, London, and GEORGE CHARLES GRIMES, of Wandsworth, Surrey. *Improvements in the manufacture of lucifer or congreve matches, and other instantaneous lights.* Patent dated December 21, 1854. (No. 2691.)

These improvements relate to the arranging and combining of apparatus by which the operation of applying the chemical composition to matches may be more readily effected, and also by which, when the composition has been applied, the splints of wood, or other materials, may be readily removed from the frames or clamps into suitable boxes, or other receivers.

BERTRAM, WILLIAM, of Upper Harden-street, Woolwich, Kent. *Improvements in the manufacture of iron ships, steam, and other boilers, bridges, and other structures where numerous sheets of iron are used.* Patent dated December 21, 1854. (No. 2692.)

This invention mainly consists in welding together the sheets of iron of which ships, boilers, &c., are formed by means of portable forges, blast-furnaces, and other suitable apparatus.

GREENER, WILLIAM, of Birmingham, Warwick, gun-maker. *Improvements in repeating military rifles, carbines, and pistols, and in cartridges to be used therewith.* Patent dated December 21, 1854. (No. 2693.)

This invention consists—1. In the construction of repeating fire-arms in which the barrel is caused to advance for the purpose of being loaded, &c.; and 2. In the manufacture of perforated cartridge cases of skin which is reducible at a low heat.

RENDER, HENRY, of Liverpool, Lancaster, gentleman. *Improvements in the manufacture of night-lights.* Patent dated December 21, 1854. (No. 2694.)

This invention consists in the peculiar application of a short wide glass tube to night-lights, instead of the paper, gelatine, or other wrappers usually employed.

SCULFORT, GUSTAVE IRENEE, manufacturer, of Maubeuge, French Empire. *Certain improvements in manufacturing screw-plates.* Patent dated December 21, 1854. (No. 2696.)

This invention consists in the combination of a circular screw stock with two, three, or more dies held and guided to the centre by several described methods.

SMITH, JABEZ, of Bedford, silk-mercer. *An improved buckle or fastening.* Patent dated December 21, 1854. (No. 2697.)

This improved fastening is composed of two parts, one being a buckle, or substitute for a buckle, and the other a tab or strap punched with holes at intervals, and furnished with eyelets or not, as may be desired. The buckle consists of a metal loop, to the centre of one of the bends or faces of which is fixed a rigid tongue or stud, projecting outward in the case of the tongue, and upward in the case of the stud. The

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opposite bend or face of the loop will sometimes have two or more holes made therein for the purpose of keeping it in its position, if necessary, when attached to any article to which it is required to be applied.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of railway and other wheels.* (A communication.) Patent dated December 21, 1854. (No. 2698.)

Claims.—1. A general construction and arrangement of machinery or apparatus, for making railway and other wheels. 2. A mode of making the wheel blank by coiling a bar of iron in a spiral or helical form round a mandril. 3. A mode of shaping the wheel blank without welding, by means of a metal-shaping ring, a large hammer, and an anvil having its face corresponding to the lower contour of the wheel to be produced. 4. The application and use of movable rollers, actuated by a small steam engine, for pressing down the upper roller, pushing forward the horizontal roller, and effecting the horizontal movement of the upper and lower rollers, or of the support carrying the wheel under process of manufacture.

MARGUERITTE, LOUIS JOSEPH FRÉDERIC, chemist, of Paris, France. *Improvements in the manufacture of sulphuric acid.* Patent dated December 22, 1854. (No. 2700.)

Claims.—1. Applying the action of phosphoric acid upon sulphate of lime, barytes, magnesia, and similar bases, to the manufacture of sulphuric acid. 2. Applying the action of chlorhydric acid upon sulphate of soda, potash, or lead, to the manufacture of sulphuric acid.

MARGUERITTE, LOUIS JOSEPH FREDERIC, chemist, of Paris, France. *Improvements in the manufacture of caustic and carbonated potash and soda.* Patent dated December 22, 1854. (No. 2701.)

Claims.—1. "The method of preparing sulphate of potash, and of soda, in a continuous manner, and without free sulphuric acid, by calcining sulphate of lead with chlorides of potassium, and of sodium, and by regenerating the sulphate of lead. 2. The method of preparing, in a continuous manner, pyrophosphates and metaphosphates of potash, and of soda, either by calcining pyrophosphate and metaphosphate of lead, and of zinc, with the chlorides of potassium, and of sodium, or by decomposing phosphate of lime by sulphuric acid, and also phosphate of lead by chlorhydric acid; and also the method of regenerating pyrophosphate and metaphosphate of lead and of zinc, by means of pyrophosphate and metaphosphate of lime and chloride of lead, and of zinc. 3. Preparing caustic potash and soda by merely adding lime to the pyrophosphate of potash, or of soda."

HUNT, JOHN, of Birmingham, Warwick, brass-founder. *An improvement or improvements in illumination.* Patent dated December 22, 1854. (No. 2702.)

This invention consists—1. In the introduction of a plate or deflector into the interior of lamp shades, or glasses, which are closed, or nearly closed, at the top, and through which air circulates whether the said deflectors be combined with a vessel containing an absorbent of carbonic acid gas, or otherwise. 2. In the ventilation of lamp-glasses or shades which are closed, or nearly closed at top, by means of a perforated metallic ornament surrounding the same.

PRINCE, FREDERICK, of Haverstock-hill, Middlesex. *Certain improvements in the nipples of fire-arms.* Patent dated December 22, 1854. (No. 2705.)

Claim.—Drilling the holes of fire-arm nipples, either wholly or partially in a diagonal direction, for the purpose of conducting the fire more readily to the charge, instead of drilling them in a central direction throughout, as hitherto practised.

LOYSEL, EDWARD, of Rue de Gretry, Paris, France, civil engineer. *An improved apparatus for cooking or preparing edible substances.* Patent dated December 22, 1854. (No. 2706.)

The inventor describes an apparatus in which two dish-shaped vessels with perforated false bottoms are hinged together and provided with handles, so that the apparatus with the edible substances in it may be turned over on the fire from time to time as may be required.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HICKMAN, JOHN, of Birmingham, Warwick, manufacturer, and ISAAC SMITH, of Birmingham, machinist. *A new or improved stop-cock.* Application dated December 16, 1854. (No. 2650.)

The inventors describe a stop-cock in which, when a plunger is pressed down a dome or cup is pressed upon a valve-seat, and the waterway is closed; and when the plunger is raised, the dome or cup rises by its own elasticity, and the waterway is opened.

FORSHAW, THOMAS, of Manchester, Lancaster, calenderer. *Improvements in machinery or apparatus for beetling woven fabrics.* Application dated December 16, 1854. (No. 2651.)

The inventor says—"I propose to fix a number of cylinders on framework at each side of the cloth-roller, with corrugated or indented beaters at the end of each piston, so that as the steam acts upon the pistons, it will give direct action to them, and cause the beaters to strike the fabric on the roller; and as the roll of cloth will become less in

diameter during the process of beetling, the direct action of the piston will still force the beater against the cloth, however much it may be diminished."

EASSIE, WILLIAM, of Gloucester, railway-contractor. *Improvements in means of stopping or retarding vehicles used on railways.* Application dated December 16, 1854. (No. 2654.)

In the arrangement described by the inventor a rod, with a joint coming through the buffer, and working with it, actuates a vertical lever, this lever being connected with the break-block by means of a rod, with a number of teeth fitting on a pin fastened at the bottom end of the vertical lever, and the whole being regulated by means of a horizontal shaft running through the centre of the waggon.

DEMING, DAVID D., of New York, United States of America. *A machine for cutting cloth or other material used in the manufacture of all kinds of wearing apparel, and also for cutting all other articles of a uniform thickness, and which are required to be of any particular pattern, and for whatever purpose intended, and by which they may be cut with perfect accuracy, and with almost inconceivable rapidity.* Application dated December 16, 1854. (No. 2656.)

The inventor represents his invention as consisting in "the device or application of permanent knives or cutters, arranged in any desired pattern or shape, and whether upon cylinders or otherwise, and which cut the article required by means of pressure upon them."

WIMMER, LEOPOLD, of Vienna, Austria, baker. *Improvements in baking.* Application dated December 16, 1854. (No. 2658.)

This invention consists—1. In constructing ovens of cast or wrought iron plates, convex in their upper, and slightly concave in their lower parts, and in so conducting the fire, by which the oven is to be heated from the outside, that it will circulate first above and next below the oven. 2. In so arranging the flues through which the heat is to circulate that the temperature of the oven can be regulated according to the indications of a thermometer. 3. In giving the oven a sloping position, so that its bottom will rise from the mouth to the farther end and transversely, thereby enabling the workman to watch with greater ease the progress of the baking. 4. In introducing into the interior of the oven a steam pipe, through which a jet of steam may occasionally be directed upon the surfaces of loaves whilst they are being baked.

MORRISON, MARIA, of Chelsea, Middlesex. *A mode of preserving inscriptions and paintings on glass, applicable for monumental and other tablets.* Application dated December 18, 1854. (No. 2659.)

The inventress takes two glass plates, and, after inscribing or painting upon one of them, cements the two together—the inscribed or painted face of the one coming against the other.

GILPIN, WILLIAM, of Moorgate-street, London, and ABRAHAM BOWEN, of Stafford-street, Peckham, engineers. *A new method for the effectual consumption or prevention of smoke, and the more perfect combustion of coals and other fuel, by means of a mechanical apparatus and furnace-bars of a certain construction; a portion of the same may be applied for raising water, and in furnaces where blast is required.* Application dated December 18, 1854. (No. 2661.)

"By means," say the inventors, "of angular bars placed in the door of the furnace, and which may also be applied as grate-bars, we prevent the radiation of heat from the furnace or oven. A further improvement consists in affixing an extra door or slide to the door already formed, of angular bars, whereby the supply of air to the furnace may be regulated." The invention also comprises the use of a screw or fan exhauster for drawing the smoke out of the furnace, &c.

QUICK, JOSEPH, of Summer-street, Southwark, civil engineer. *Improvements in the construction of furnaces.* Application dated December 19, 1854. (No. 2678.)

The inventor proposes to reduce the furnace-bars and ash-pit by about one-half their length, and to place in the space thus obtained (in the front part of the furnace) an inclined bottom; also, to introduce a hanging bridge in front of the fire bridge.

BITTLESTON, WILLIAM, senior, of Mary-street, Middlesex, architectural and engineering draughtsman. *Improvements in ploughs.* Application dated December 20, 1854. (No. 2679.)

The inventor proposes to arrange ploughs in such manner that the share shall be kept constantly lubricated.

HIGGINS, JOHN, of Oldham, Lancaster, engineer. *Improvements in steam boilers and apparatus connected therewith, parts of which improvements are applicable to valves and steam indicators.* Application dated December 20, 1854. (No. 2682.)

This invention mainly consists in fixing a number of tubes in the boiler, in a transverse direction, and in making the furnace and bridge in one compact frame-work of sheet iron, tin, or other suitable material, and connecting it to the door frame, the whole of which is made hollow, the water passing through it on its way to the boiler.

COCHRANE, ALEXANDER, of Kirkton Bleach Works, Renfrew, North Britain, bleacher. *Improvements in starching textile fabrics.* Application dated December 20, 1854. (No. 2685.)

[redacted]

The principal feature of one modification of this invention consists in causing a layer of the material to be starched to pass over a sharp edge under great tensional strain, in contact with the starching web from which the starch is well pressed into the fibres of the treated fabric.

Baker, Thomas and Samuel, of Liverpool, Lancaster, engineers. *Improvements in the mode or method of lifting or lowering weights or heavy bodies by steam or hand power.* Application dated December 21, 1854. (No. 2689.)

This invention mainly consists of an improved crab winch, to which is applied an ordinary direct acting steam engine, or pair of engines. The engines are fixed upon the same foundation plate and framing as the crab winch, and are connected to the first motion shaft of the crab by the crank of the steam engine. The power is multiplied by means of a screw, or worm, working into a worm wheel, and a suitable system of levers are applied to a break for lowering.

Venables, John, and Arthur Mann, of Burslem, Stafford, earthenware manufacturers. *Printing and fixing self and other colours in china, earthenware, parian, gypsum, stoneware, bricks, blocks, bats, slabs, tiles, quarries, glass, metals, hardware, gums and gummeous substances, and papier-maché ware.* Application dated December 21, 1854. (No. 2690.)

The inventors take plates of some hard material and engrave them with the pattern or design intended to be fixed in the manufactured articles. They afterwards rub into these plates the colours to be fixed until the engraved parts are filled with them. They then lay a fabric of paper or cloth upon the plates and subject it to pressure: the colours are thus deposited on the fabric which is then brought in contact with the article to be ornamented and the colours are transferred.

Smith, Andrew, of Princes-street, St. Martin's-in-the-Fields, engineer, and James Thompson Mackenzie, of Lombard-street, Middlesex, merchant. *Improvements in ordnance and small arms, by applying thereto projectile force obtained from high-pressure steam.* Application dated December 21, 1854. (No. 2695.)

The inventors propose to propel projectiles from ordnance resembling cannon, but larger than they, by means of high-pressure steam obtained by surrounding boilers or generators with molten metal.

Johnson, John Henry of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the application of electrotype or galvano-plastic processes.* (A communication.) Application dated December 21, 1854. (No. 2699.)

The inventor forms moulds of statuettes and other such objects in two halves, which he then brings together and unites, and fills with a metallic solution in which is suspended a metal plate in connection with a galvanic battery, by means of which a deposit is made upon the interior of the mould.

Suter, Alfred, of Fenchurch-street, London. *A wind guard to cure smoky chimneys or ventilate rooms or buildings.* Application dated December 22, 1854. (No. 2703.)

The inventor proposes to employ a chimney pot, over the mouth of which, at the height of about 5 inches, is fixed a disc of the same size as the mouth of the pot. To protect the smoke-opening between the pot and the disc from the wind, there is placed round the opening a band of about 7 inches deep and 18 inches diameter, extending 1 inch above the disc and 1 inch below the top of the pot.

Ashworth, Robert, of Rochdale, Lancaster, engineer, and Samuel Stott, cotton-spinner, also of Rochdale, Lancaster. *Improvements in machinery for preparing, spinning, and doubling fibrous substances.* Application dated December 22, 1854. (No. 2704.)

"This invention consists," say the inventors, "First, In constructing compound spindles, that is to say, we have a hollow spindle free to revolve in suitable bearings on the top of which is secured the flyer. Through the hollow spindle and collar of the flyer we pass another spindle or rod on the upper part of which we fix a circular plate for carrying the bobbin. The circular plate which carries the bobbin is for the purpose of regulating the speed of the bobbin by acting as a drag and allowing the bobbin to run at a speed equal to the length of yarn to be wound on the bobbin. When the bobbin becomes full we propose to draw the inner spindle or rod down through the hollow spindle, to the extent of the length of a bobbin, so that the full bobbin may fall off, to be replaced by an empty one." The invention consists secondly, in pressing together rollers which are used for drawing fibrous substances by an elastic substance in such manner as not to exert any force or weight on the bearings of the bottom roller.

Downie, John, of Glasgow, Lanark, North Britain, engineer. *Improvements in fire-arms.* Application dated December 22, 1854. (No. 2709.)

The inventor carefully bores a central piece of wrought iron to the required size, places it within a suitable mould shaped internally to the intended form of the finished piece, and then fills the space between the two with cast iron.

Bellford, Auguste Edouard Loradoux, of Castle-street, London. *A new and useful improvement in breech loading fire-arms.* (A communication.) Application dated December 22, 1854. (No. 2711.)

This invention consists in the "construction and application of a chambered breech fitting to the barrel with a male and female cone, and capable of receiving two motions, viz., one a short distance back and forth in line with the barrel, the other to raise the mouth of the chamber above the barrel."

PROVISIONAL PROTECTIONS.

Dated May 17, 1855.

1119. William Smith, of Salisbury-street, Adelphi, Middlesex. A new machine for cleaning cotton and other fibrous materials. A communication from M. Edmond Neven, of Malaunay, France.

Dated June 7, 1855.

1298. Pierre Antoine Favre, professor of chemistry, Marseilles, France. Certain improvements in employing the residue arising from the lixiviation of crude sodas.

Dated June 9, 1855.

1318. Cromwell Fleetwood Varley, of Charles-street, St. Pancras, Middlesex. Improvements in electric telegraphs.

Dated June 16, 1855.

1376. James Lowe, of East Greenwich, Kent, machinist. Improved apparatus to be employed in place of paddle-wheels or ordinary stern propellers for propelling vessels.

Dated June 19, 1855.

1395. Jehiel Forbes Norton, of Manchester, Lancaster, merchant. Improvements in machinery or apparatus for measuring liquids and fluids, which is also applicable for obtaining motive power. A communication.

1397. Francis Burke, of Woodlands, Montserrat, British West Indies. Improvements in preparing pulp or pulpous material, applicable in the manufacture of paper, and for other useful purposes.

1399. Daniel Gover of King-street, Long-acre, Middlesex, builder. Improvements in the construction of gun-carriages, and appliances connected therewith.

1401. John Henry Johnson, of Lincoln's-Inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for emptying cesspools and privies. A communication from Jean Pierre Louis Florimond Datichy, of Paris, France, mechanician.

1403. John Henry Johnson, of Lincoln's-Inn-fields, Middlesex, gentleman. Improvements in the manufacture of dish-covers, dishes, plates, and other articles of sheet metal, and in the machinery or apparatus employed therein. A communication from Fleury Victor Alard, of Paris, France, engraver.

Dated June 20, 1855.

1409. James Gernon, of Buckingham-street, Adelphi, Middlesex. Improvements in the manufacture of plaster of Paris and cement. A communication.

1413. Uriah Lane, of Regency-square, Brighton, Sussex. An improvement in the manufacture of pumps.

1415. Louis Pol, piano-maker, of Paris, France. Certain improvements in pianofortes.

1417. Jean François Victor Fabien, of Paris, France, gentleman. Improved machinery for manufacturing wheels. A communication.

Dated June 21, 1855.

1418. John Louis Jullion, of Combe House, Tovil, Kent, analytical chemist. The manufacture of paper, card, and millboard from certain vegetable productions.

1419. William Crane Wilkins, of Long-acre, Westminster, lighthouse engineer. An improvement in lamps.

1420. Pierre François Rioux, of Faubourg St. Denis, near Paris, and Leon de Pariente, of Rue de Brabant, Faubourg of Schaerbeck next Brussells, Belgium. Improvements in the fixing of metallic ornaments upon paper, flock, leather, cotton, silk, or any other fabrics to which such ornaments may be applicable. A communication.

1421. Matthew Shelley, of Union-crescent, Union-street, Kingsland-road, Middlesex, engineer. Improvements in cooking utensils.

1422. James Robert Birch, of Washington-street, Liverpool, Lancaster. An improved boat-plug or self-acting valve.

1423. Jacob Ben' Jamin, of Leadenhall-street, London. Improvements in apparatus for the manufacture of gas. A communication from Henri Leprince, of Liége, Belgium.

1424. Theodore Bougereau, of Lime-street. Improvements in apparatus for roasting coffee.

1425. Richard Keevil, of Lacock, Chippenham. Improvements in vessels used in the manufacture of cheese.

1426. William Basébé, of Mayfield-place, High-street, Kensington. An improvement in the manufacture of paper.

1427. Charles Edmund Green, of Blandford-street, Portman-square, Middlesex. Improvements in huts, tents, and camp-hospitals.

1428. Luther Young, of Bow-lane, Cheapside, London, gas fitter. An improvement in the construction of gas-regulators.

1429. Thomas Carey Willard Pierce, of Manchester, Lancaster, merchant. Certain improvements in machinery or apparatus for finishing yarns or threads manufactured from cotton, silk, flax, or other textile materials.

1430. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in steam engines for pumping and other purposes, part of which improvements is also applicable to pumps. A communication.

Dated June 22, 1855.

1432. Oliver Rice Chase, of Boston, United States of America. An improved machine for making lozenges, and for other purposes.

1434. Stephen White, of Liverpool, Lancaster, miller. Improvements in washing, cleansing, and drying grain.

1436. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in breech-loading fire-arms, and cartridges relating thereto. A communication.

1438. John Gay Newton Alleyne, of Butterley Ironworks, Alfreton, Derby, and Henry Strafford, of Codnor Park Ironworks, Alfreton, Derby. Improvements in railway brakes.

Dated June 23, 1855.

1440. Stanislas Tranquille Modeste Sorel, of Paris, France, civil engineer. A machine for applying adhesive matters on stuffs, and also for applying on the said matters other substances or stuffs.

1442. Frederick William Mowbray, of Shipley, near Leeds, York, engineer. Improvements in looms for weaving.

1446. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in the manufacture of bats for felting, and in machinery for manufacturing the same. A communication.

Dated June 25, 1855.

1448. John Young, of Linton, near Morbattle, Roxburghshire, Scotland, blacksmith. Improvements in, and applicable to, harrows.

1450. John Page, of Perth, North Britain, civil engineer. Improvements in moulding or shaping metals.

1452. Moses Poole, of the Avenue-road, Regent's-park, Middlesex. An improvement in sculpturing surfaces of marble and stone. A communication.

Dated June 26, 1855.

1454. Auguste Edouard Loradoux Bellford, of Essex-street, London. Certain improvements in rotary blowing-machines, which are also applicable to rotary pumps, to rotary engines to be driven by steam or other fluids, and to meters for measuring the flow of fluid bodies. A communication.

1456. Frederick Leiss and Charles Schneider, of Hesse Darmstadt, Germany. Manufacturing mica letters, numerals, shop-signs, figures, arms, devices, and ornaments.

1458. Moses Poole, of Avenue-road, Regent's-park. An improvement in the manufacture of printing-rollers or cylinders. A communication.

1460. François Vennin - Derégniaux, of Lille, France, machine-maker. Improvements in the construction of spinning-machinery.

1462. Joseph John Bucknall, of Liverpool, Lancaster, gentleman. Improvements in the manufacture of hats and caps, and the employment of certain tools for producing the same.

1464. James Moore Clements, of Great Hampton-street, Birmingham, Warwick, tailor and draper. Certain improvements in pockets with spring lock fastening, applicable to male and female attire, as also as a fastening for bags, reticules, purses, or similar articles.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 10th, 1855.*)

432. Thomas Helliwell and Joseph Barker. Preserving pickers and pickersticks, and for preventing cops being knocked off the spindle in the shuttle during the process of weaving in the power-loom.

434. James Reddie. An improved metal shovel.

443. Fischer Alexander Wilson. Improvements in closing and unclosing bottles and other vessels used for containing liquids, also in the modes of inserting, securing, and liberating liquids therein and therefrom.

449. Bewicke Blackburn. Improvements in the manufacture of pipes.

459. Thomas Dodds and Richard Leake. Certain improvements in the construction of a machine for heating all kinds and descriptions of furnaces with coal or other gases.

461. Constant Jouffroy Dumery. Improvements in alarm and safety-whistles for steam-generators.

465. John Johnson. Improvements in temporary rudders.

466. William George Henry Taunton. Improvements in pumps, pump-gear, and pump-buckets.

478. Robert Boby. Improvements in corn-dressing and winnowing machines.

482. John Gledhill and Robert Gledhill. Improvements in the preparation of silk, flax, and other fibrous substances, and in the machinery or apparatus employed therein, part of which is applicable to the preparing of wool for combing.

488. Arsène Louis Garnier. An improved process for producing photographic pictures, which he intends to denominate "Système Garnier de Photocherographie Coloriée."

534. William Foster. Improvements in machinery or apparatus for cleansing wool and other fibrous materials.

544. Charles Heaven. Improvements in machinery used for embroidering fabrics.

567. Benjamin Goodfellow. Improvements in regulating the power for driving the pumps of hydraulic presses.

579. Abraham Davis. An improved polishing-powder.

715. Theophilus Wood Bunning. An improvement in steam-engines.

716. Theophilus Wood Bunning. Improvements in steam-engines.

751. Samuel Greenwood. Improvements in machinery for making rivets, bolts, nuts, and other similar articles.

767. Anguish Honour Augustus Durant. An improved axle and axle-box for carriage-wheels, shafts, axles, or general bearings of machinery.

775. Louis Ambroise Michel Mouchel. An improved method of joining pipes, tubes, and ducts. A communication.

805. James Lee Norton. Improvements in separating wool and other animal fibres from vegetable matters, and in drying wool and other animal fibres.

1104. Edward Pellew Plenty and William Pain. An improvement in ploughs.

1132. Samuel Stocker. Improvements in machinery and apparatus for shaping of metals, and also in such metal goods made from sheets, plates, or tubes, and also for other parts connected therewith, and for finishing the same when left by the machine or apparatus.

1205 Gottlieb Neuffer. An improved mode of producing patterns upon floor-cloths and other ornamental coverings for floors, walls, tables, and other surfaces.

1221. Henry Grafton. Improvements in apparatus for heating and cooking.

1306. Charles Constant Joseph Guffroy. An improved smoke-consuming apparatus.

1339. Samuel Coulson. An improvement in the preparation of sulphate of baryta, and in the manufacture of glass when sulphate of baryta is used.

1367. Henry Bridgewater. An improved construction of spike for railway and other purposes.

1374. James Webster. A new or improved balance.

1379. Louis Henri Réal. Certain improvements in elastic bottoms or seatings for beds, mattresses, and seats.

1382. Henry Bessemer. Improvements in screw-propellers, and in the shafts and cranks by which they are driven, which improvements are also applicable generally to the shanks of marine, stationary and locomotive steam-engines.

1384. Henry Bessemer. Improvements in the manufacture of cast steel, and mixtures of steel and cast-iron.

1386. Henry Bessemer. Improvements in the manufacture of ordnance.

1388. Henry Bessemer. Improvements in the manufacture of rolls or cylinders used in the lamination, shaping, and cutting of metals, in crushing ores and other substances, and in calendering, glazing, embossing, printing, and pressing.

1390. Henry Bessemer. Improvements in the manufacture of railway-wheels.

1398. John Macintosh. Improvements in fuses, fusees, and matches.

1412. Robert Watson Savage. Improvements in single and double-acting swing-doors.

1442. Frederick William Mowbray. Improvements in looms for weaving.

Opposition can be entered to the granting of a Patent to any of the parties in the above

List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed June 29, 1855.

906. Alfred Jenkin.
911. William Westley Richards.
912. Josiah Horsfall.
984. Frederick William Harrold.
987. Thomas Ridgway Bridson.
1010. James Pearson.

Sealed July 3rd, 1855.

27. Louis Jacques Martin.
29. William Henry Bulmer and William Bailey.
32. John Livesey.
34. Benjamin Cook.
45. Robert McCall.
53. Joseph Offord.
54. André Gaspard Guesdron.
56. Nathaniel Jones Amies.
76. James Wood.
115. Jonathan Saunders.
189. Charles Frederick Burnard.
216. Henri Louis Dormoy.
217. John Doddridge Humphreys.
227. David Moline.
437. James Higgin.
671. John Marland.
763. Joseph Edwin Frost.
843. George Fergusson Wilson and Warren De la Rue.
857. William Madeley and Thomas Hanlon.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1667.] SATURDAY, JULY 21, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

BESSEMER'S PATENT IMPROVEMENTS IN PROJECTILES AND ORDNANCE.

Fig. 9.

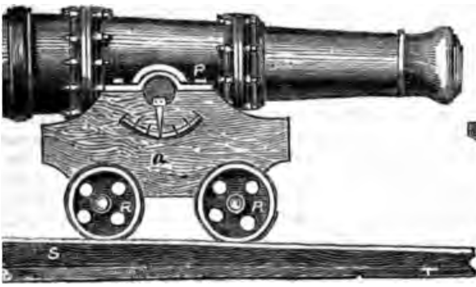


Fig. 8.

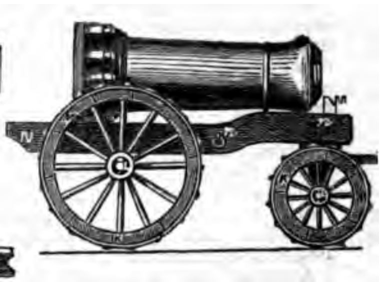
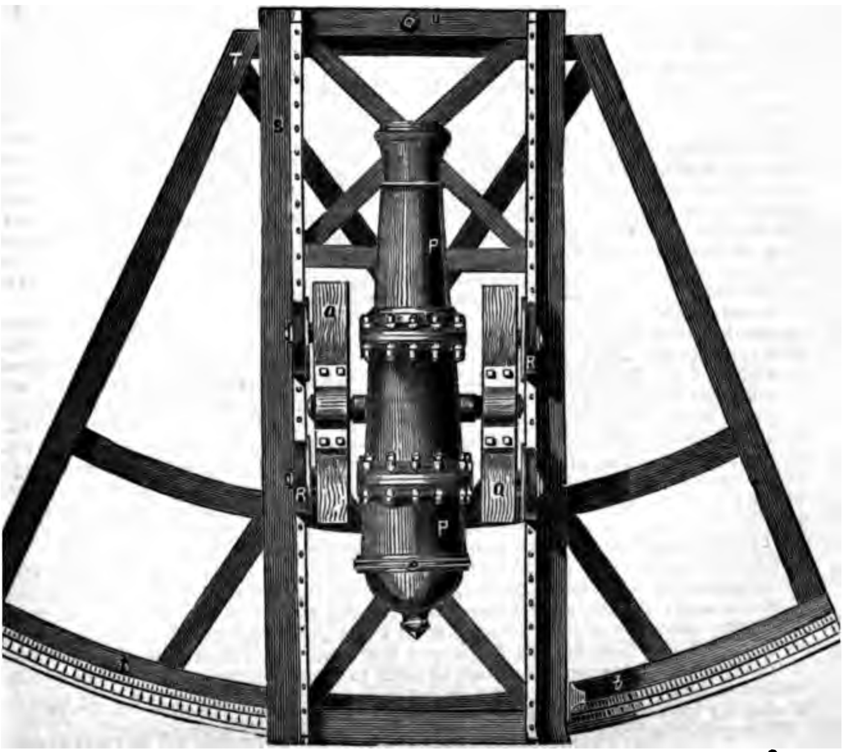


Fig. 10.



BESSEMER'S PATENT IMPROVEMENTS IN PROJECTILES AND ORDNANCE.

Mr. H. Bessemer has recently patented several improvements in projectiles and ordnance. Those included under his patent bearing date November 24, 1854, relate firstly to that kind of projectiles which are of an elongated form, and consist in imparting to such projectiles a rotary motion about their longer axes during their passage through the air without the aid of rifle grooves, and without any deviation from the true cylindrical bore of the gun. To effect this object, he makes a suitable passage or passages in the projectile parallel to its axis, and open at that end of it which is nearest to the breech of the gun; an arrangement somewhat similar to that adopted in Mr. Hale's rockets, of which we published a description on page 481, vol. lxi. (No. 1632). Through these openings a part of the exploded charge of powder finds its way, and is emitted from the opposite sides of the projectiles in the direction of a tangent to its circumference, the reactive force of the exploded gunpowder producing a rotary motion of the projectile in a direction opposite to that in which the gaseous matters are emitted from it. Fig. 1 of the engravings on the following page is a longitudinal elevation of a projectile furnished with such passages; fig. 2 is a similar elevation, taken in a direction at right angles to fig. 1; and fig. 3 is a cross section on the line 1 and 2 of fig. 1. *a* is the foremost end of the projectile; *b b* are two passages formed therein on opposite sides, and parallel with its longer axis; *c c* are short passages, at right angles to the passages, *b*, and communicating with them, so that a line passing through the passages, *c*, will form a tangent with the cylindrical part of the projectile; at the parts marked *d* a space is formed for the more ready expansion of the issuing gases. The inventor prefers that the projectile should be turned so as to truly fit the bore of the gun. Although only two main passages, *b*, are shown, a greater number may be used if thought necessary.

As the weight of elongated projectiles may in some cases be found too great for the guns now in use, Mr. Bessemer proposes in such cases to form in them a hollow chamber, so as to reduce them to the desired weight. A longitudinal section of a projectile made on this plan is shown at fig. 4, and fig. 5 is a cross section of it. *e e* are the passages for the gases to escape by; and *f* is the hollow chamber to reduce the weight. In lieu of the passages communicating with the charge of powder in the gun, the projectile itself may be made to contain a separate charge of powder within it, the explosion of which simultaneously with the firing of the gun will produce a rotary motion of the projectile by the escape of the exploded gases through tangential openings, as before described. This modification of the projectile is shown at fig. 6, which is a longitudinal section; *n* is the chamber for the contained charge of powder; *i*, a small passage leading to it, and through which its contents are inflamed at the time it is fired off; *j j* are passages for the emission of the charge contained in the chamber *n*. When applying this principle to projectiles of the rocket class, the inventor prefers to make the holes for the emission of the gaseous matters near to the front or foremost end of the projectile, but in a direction pointing to the back part of it, the holes being in a slanting or spiral direction, so as to produce a rotation of the rocket simultaneously with its forward motion.

In order that the charge of powder used in firing projectiles may produce a greater mechanical effect than usual, Mr. Bessemer uses a gun whose bore is larger in diameter than the projectile which is to be fired from it. The projectile is fitted into a cylindrical case of wood or other suitable material; this case is also accurately fitted to the gun, and thus a larger area is presented for the powder to act upon than would be presented by the projectile alone. The case may be used either for cylindrical or spherical shots. The application of this principle to a common spherical ball is represented in fig. 7, where *l* is the ball, and *m* is a ring of iron attached to the piece of wood, *n*, which forms a seat for the ball to rest in, while its external part fits the gun, and thus presents an area for the exploded gunpowder to act upon larger than that which the ball itself presents to the atmospheric resistance. In some cases the iron ring may be omitted, and the shield in which the ball is enclosed may be made of any suitable light material, and of greater depth.

The increase of weight caused by the elongated form of projectiles, as compared with the spherical ball of the same diameter, renders it necessary that a large charge of powder should be used; Mr. Bessemer therefore increases the internal diameter of the bore of the gun at the breech end of it, or forms that part into a spherical chamber, the entrance to which is not less than the full diameter of the bore. In all cases where these enlarged chambers are formed in guns, care must be taken to strengthen the breech of the gun by an additional thickness of metal at that part, and the powder should be put into a bag capable of adapting itself to the form of the chamber when rammed home.

When cylindrical or other elongated projectiles are used, their weight will be much greater

[redacted]

than a spherical shot of the same diameter; this circumstance renders it necessary that an increase should also be made in the weight and strength of the gun. This increase of weight would be productive of great inconvenience in the removal of the gun over bad roads, or in a marshy or mountainous district; Mr. Bessemer therefore constructs guns, the barrels of which are composed of two, three, or more pieces, of a convenient weight, which are bolted together by flanges and lugs, having steel or iron bolts passing through them. In order to ensure sufficient accuracy the flanges are turned, and each piece is made to fit a short distance into the other. A lead or other packing, fitted into an annular groove, is used to keep the joint as air-tight as possible. To avoid any undue strain on the bolts by the action of the exploded powder between the joints, the flanges are made to approach each other as nearly as possible at the central part of them, beyond which an annular recess is formed on the face of the flange, from which recess there are radial openings, so that whatever gaseous matters escape from the central part may find an easy egress through them without exerting much expansive force upon the joints. "By this mode of forming the gun of various parts," says the inventor, "I am enabled to use wrought iron and steel in some cases, and thus form a gun of great strength, the parts of which are of comparatively little weight, while it also admits of the various parts being made of the metals most suitable to resist the peculiar strain and wear to which they are severally subjected when in use." In order to facilitate the removal of the different parts of which such guns are composed, he constructs a suitable carriage for each piece, and so fixes it thereon that it shall be in a convenient position for being wheeled up to and placed in juxtaposition with the piece to which it is to be screwed. For this purpose he forms a four-wheeled carriage, as represented in side elevation at fig. 8. K K are the carriage wheels, which have stout

Fig. 1.

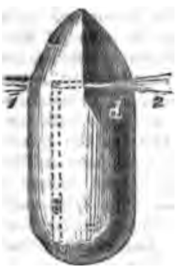


Fig. 2.

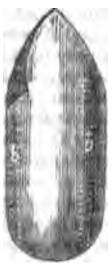


Fig. 4.

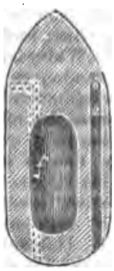


Fig. 6.

Fig. 3.

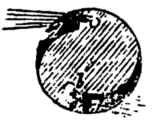


Fig. 7.

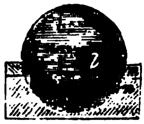


Fig. 5.

axletrees, L L, passing through their naves; and resting on these axletrees is a bed, N, hollowed out in its upper side, so as to correspond with the curved exterior of the gun. M M are two movable stop pieces, morticed into the bed to prevent the slipping off of the load, which, in the case represented, consists of the muzzle end of the gun; there are ring bolts at *n*, for the purpose of passing a rope through, so as to lash the gun-piece firmly to the carriage, and in this way each piece of the gun may be conveyed separately to the place where the main gun carriage is erected. The gun is supported on trunnions, which rest in a low carriage or truck, the wheels of which run on rails secured to a massive timber frame, so that the gun may be run out freely after the recoil. The rail frame has a movement laterally at one end, by which means the gun may be pointed as required. For the facility of loading and cleansing the gun, the carriage is so constructed as to admit of its turning entirely round in a horizontal direction, either on a smooth metal circular slide or on wheels. The foundation frame has on it graduations, numbered in such a manner that the position of the rail frame may be brought at any time to a known point; while on the trunnion a pointer is also used to indicate the exact elevation, so that the gun may be used at night, and be directed to any desired point which had been ascertained and noted during the day-light. The particular form of the gun carriage which the inventor prefers to use for guns of heavy weight, constructed in several parts, is represented in fig. 9, which is

a side elevation of the gun mounted on its carriage and frame, and at fig. 10, which is a plan of the same. P is the gun, composed of three parts, as before described, its trunnions resting on a carriage, Q, which is supported on wheels, R; these are provided with flanges, as is usual with wheels which run on rails. S S is a stout timber framing, consisting chiefly of two stout timbers, which are parallel to each other, on which flat iron bar rails are screwed, so as to form guides for the carriage wheels to run on; the frame, S, is made higher at one end than at the other, in order that the force of the recoil may be in part taken up by the whole mass having to ascend an inclined plane, which will also have the effect of rendering it more easy to run out the gun, as it will then have to descend an inclined plane. The frame, S, is supported upon another piece of frame-work, T, which should be firmly bedded on the ground; a large iron pin, U, passes through one end of the frame, S, and is fastened to the frame, T, where it forms a centre of motion for the frame, S, to turn upon; the other end of the frame, S, rests upon the curved part, *t*, of the lower frame-work; this curved part is graduated, as shown. On the trunnion of the gun is placed the pointer above-mentioned, with a graduated quadrant beneath it, formed on one side of the carriage frame.*

THE MANUFACTURE OF SMALL ARMS AND ARTILLERY.

It will give general satisfaction when we state that the mechanical resources of the country are every day being brought nearer to a practical bearing upon the prosecution of the war. Perhaps no more striking illustration can be given of this than by some account of the experiments which, under the sanction of Government, Mr. Whitworth, the eminent machinist, is conducting at Manchester. We have the less hesitation in entering on these details, because the information thus communicated can be of no possible service to the enemy, though it may help them to perceive at what disadvantages they will shortly be compelled to carry on this war, if they continue it until we have the full use of our strength. It is unnecessary, after the experience of the army in the Crimea, and after the Russian testimony freely rendered on the same point, to dilate upon the effectiveness of the Minié rifle; but when it became requisite to obtain this weapon in large quantities for the use of our troops, it was found that, owing to various causes, the private trade was unable, within the assigned limits of time and cost, to furnish the supply. In some measure the manufacturers evinced a reprehensible want of enterprise, especially in the employment of improved machinery; but the chief culpability rested with the late Board of Ordnance, which by the absurdity of its system of contracts had managed completely to disorganize the trade. Under these circumstances, when the Board applied to Parliament for the means of erecting a small arms factory on its own account, a vigorous opposition was offered on the part of the Birmingham gun-makers, and the result was the appointment of a select committee, before which a number of witnesses were examined. Among those witnessed was Mr. Whitworth, and in the course of his evidence he proceeded to show that, notwithstanding the great superiority of the Minié as a military weapon, and notwithstanding the example set, in Colt's pistol and in other cases, of what could be effected by machinery in the manufacture of fire-arms, we had practically no sufficiently authentic *data* on which to proceed in establishing such a factory; that we knew little or nothing as to the real state of the interior of barrels, and that the best form of barrels still remained undetermined except by a vague rule of thumb. Mr. Whitworth demonstrated these positions to the committee in a very simple manner. He showed, in the first instance, that it was possible to measure sizes mechanically up even to the millionth part of an inch; secondly, that no steps had hitherto been taken, by means of "difference gauges," prepared in conformity with this wonderful measuring power, to test the accuracy of dimension and surface obtained in the interior of barrels. Until that was done, he clearly proved that no sound conclusions could be arrived at as to what the true form of bore ought to be, and, without such conclusions, Government, in proceeding to manufacture arms on its own account, would necessarily be going to work very much in the dark. The differences of opinion among the gun-makers themselves as to the true form of bore amply confirmed these deductions; and, in consequence of the importance which he attached to the subject, Mr. Whitworth was induced to send in an offer to the Government, volunteering, if they would give a certain sum of money for the construction of a shooting gallery in which to conduct the experiments,

* For Mr. Bessemer's claims, see *Mech. Mag.* vol. lxii., p. 469, No. 1662.

[redacted]

that he would give his time and talents gratuitously to the task of making them. The tender of such valuable services thus liberally made was at once accepted, and during the winter and spring Mr. Whitworth has been steadily and zealously engaged in prosecuting his self-imposed labours of inquiry. He has erected within his own grounds, near Manchester, a shooting gallery, 500 yards long, and so contrived that, for the first time, a series of experiments may be made as nearly as possible under the same conditions. Not only is the projectile in its flight protected against the varying effects of atmospheric currents, but, by a simple arrangement of paper screens, its exact course from the point of delivery to the target is accurately registered. By preserving a uniform temperature at the end of the gallery where the gun is fired, and by adopting certain ingenious mechanical appliances with reference to the recoil, guarantees are obtained that each shot shall be taken under precisely similar circumstances. It would not be easy to detail here the exact nature of the appliances bearing on the recoil, nor is it necessary to do so; but their general character will be understood when we state that the gun fits accurately into a framework which rests upon a perfect plane, that, where recoil is allowed for, it must take place in a line perfectly parallel to the axis of the gun, and can be calculated to a nicety; and, that when the object is to prevent any recoil whatever, there is no difficulty in doing so. The target, which is an iron one, travels easily to any point in the gallery on rails laid down for the purpose, and the distances are regularly marked on the side wall in order to determine the exact range.

Such being the plan adopted by him for this part of his work, Mr. Whitworth took the following means for obtaining an accuracy never before attempted in the bore of fire-arms. The regulation size of the Minié bore being ·578 of an inch,—adopting that as his standard, and bringing into requisition that extraordinary accuracy of mechanical execution which has placed him at the head of our machinists,—he made a series of what he calls "difference gauges," representing successive differences in size above and below this standard, each stage of increase or decrease being exactly the 5,000th of an inch. It is obvious that, working to these gauges—which can be done with the utmost facility—a degree of precision is attainable in the bore of gun barrels, the extent of which may be best estimated when we state that the most expert Birmingham manufacturers for Government have never reached a higher standard of measure than the 350th of an inch. Under the tests thus obtained by him, Mr. Whitworth found that the most carefully finished barrels hitherto produced had bores devoid of all truthfulness, and made up of inequalities which must detract in an important degree from the precision with which they delivered the projectiles fired from them. In some portions the bore was a cone in one direction, in some in the opposite; some parts were cylindrical where not intended to be so, or *vice versâ*. Subjecting them to still further trial in the shooting gallery, he found the evidence of his "difference gauges" entirely confirmed by the uncertainty in the flight of the projectile. He has now finished two barrels, one 10 inches, and the other 20 inches long, which, though not absolutely perfect in their fire, come so very near it as to justify the expectation of attaining it, which he confidently entertains. Several qualifying circumstances, as, for instance, the proper pitch of the rifling in proportion to the length of the barrel, will amply account for his want of entire success; and this view of the case seems confirmed by the fact that hitherto the experiments indicate a limit to the length of the projectile beyond which it refuses to take the right spin, and consequently becomes erratic in its course. An absolute true delivery of the projectile once attained, the road will be at once gained which leads with certainty to an immense number of highly important scientific, as well as practical results, upon which, at present, there prevails the greatest doubt. But even as matters stand, much has been achieved. It is no slight affair that the skill of the mechanical engineer should at length be brought in aid of gun-making, and that one trade, which from various causes appeared to have the spirit of progress arrested within it, should be brought fairly within the influence of another so calculated to give it a great impulse, and to which, indeed, in the industrial world, it is naturally subordinated. Again, following the example set by the Admiralty long ago, in requiring that their marine engines should be fitted according to the dimensions of Whitworth's "taps and dyes," the authorities, exercising the power formerly possessed by the Board of Ordnance, could not adopt a wiser course than to make his "difference gauges" their standards of measure in the small arms supplied to them by the private trade. Their doing so would insure a degree of uniformity and of perfection in the barrels which cannot be attained otherwise, and the importance of which every one who is at all conversant with the subject will readily appreciate.

The experiments in which he has been engaged on behalf of the Government have naturally led Mr. Whitworth to turn his

attention closely to the whole subject of small arms and artillery, and he has taken out several patents,* which, however, it is right to state are placed freely at the disposal of the Government, should it wish to avail itself of them. The most remarkable of his patents relates to a rifled cannon, which in its main features may be described as a return to the principle upon which pieces of ordnance were constructed when first introduced into modern warfare. The inner portion of the tube consists of three cast or wrought iron longitudinal sections, forming, when put together, an accurate nine-sided interior, with the requisite pitch for making the projectile rotate on its axis. Nicely adjusted wrought iron bands or rings hold these sections firmly together, and distribute evenly among them the strain of the discharge. They can be tightened up into one continuous air-tight sheathing, or removed again, and the whole taken to pieces by the action of powerful screws placed at either end of the gun; each part having its dimensions accurately determined by gauge, can be replaced in case of injury, and the touch-hole will no longer, by wearing out, render the entire cannon useless. Mr. Whitworth proposes to make this new implement of warfare breech-loading, if considered desirable, and he calculates on combining in it the advantages of weight due to the present cast iron gun, of strength, such as may be claimed for wrought iron ordnance, of a rifle bore which presents almost insuperable difficulties by any other plan, and has not been successfully surmounted in the Lancaster—finally, of a degree of portability which would tell in a thousand different ways, and would make guns of the largest calibre available in the field. The 10-inch pistol with which he commenced his experiments in the shooting gallery was constructed on this principle, and realized all his expectations. He is now making others of greater size, and no one who has examined them attentively can help admiring the ingenuity and beauty both of the design and execution. How far this new cannon may be found to answer when tested in practice, and whether it can be produced at a cost that renders its use in the service possible, are, of course, points that have yet to be determined; but, in the meantime, it certainly promises results of the highest importance to gunnery, and our military authorities will no doubt watch its progress with interest. As far as the manufacture of ordnance on the present system goes, the Russians are fully our equals, and, though it may be all very chivalrous to fight them with similar weapons, this mechanical nation has surely a right to expect that, on such a point, the British army should have a decisive superiority over that of any other country.

Not only in artillery, but in small arms also, Mr. Whitworth has taken out patents. He has invented for the latter two breech-loaders which are remarkably ingenious, and appear to fulfil every requisite condition. One bears some resemblance to the breech used in Sharpe's American rifle, being raised up from below to form the base of the barrel; but, instead of being elevated by a lever, a screw is employed, and an ingenious application of the inclined plane on one side renders the adjustment of parts perfect, and makes any escape of the gases, when the arm is discharged, impossible. The other breech-loader bears no resemblance to any invention of the kind that we have yet seen, and will, we believe, be found upon trial to have a decided superiority over all the rest. It is a double chamber on a line with the bore of the rifle, and having a reciprocating motion from right to left, or left to right, as moved by the hand of the marksman, who thus, with a single barrel, has all the advantages of a double-barrelled gun. It is hardly necessary to point out how much would be gained by giving soldiers, at a critical moment in an action, the means of firing two shots in succession, or the increased confidence which it would give a man to know that he had a second shot in reserve, if his first missed its object. Now that the Select Ordnance Committee has been enlarged, there is some ground for hope that the inventions which we have described, offered to them by the most eminent practical mechanic of his day, will be received with due respect, and fairly tested.

It is proper to state that not only Mr. Whitworth, but several other eminent machinists in and near Manchester, are actively engaged in bringing the resources of their art to bear upon the improvement of our present munitions of war. The obstinacy of the Birmingham manufacturers in resisting the introduction of machinery is rapidly transferring an important branch of trade to the great centre of northern industry. Bayonets and rifle-sights and shells are being made at Manchester upon a great scale, and we understand that the much-needed supply of mortars is in course of preparation. To those who know what the industry of this country is capable of accomplishing, it will always be a matter of regret that so much valuable time has been lost in going to the class of men who alone had it in their power to back up with the requisite superiority in *matériel* the invincible courage of our troops.—*Times*, July 13.

* Illustrated descriptions of the inventions for which these patents have been obtained will appear hereafter in our pages.—Ed. M. M.

[redacted]

BOOTH'S GAS PATENT.—Law Case.

Exchequer, Guildhall.
July 3, 1855.

Sittings at Nisi Prius, before Chief Baron Pollock and a Special Jury.

BOOTH V. KENNARD.

This was an action for the infringement of two patents, granted to the plaintiff, for improvements in the manufacture of gas. The first patent bearing date 12th November, 1850, for "improvements in the manufacture of gas," and the second bearing date 8th May, 1852, also for "improvements in the manufacture of gas."

Mr. Watson, Q.C., Mr. Webster, and Mr. Macnamara appeared for the plaintiff; Sir F. Thesiger, Mr. Hindmarch, and Mr. J. Brown, appeared for the defendant.

Mr. Watson stated the case for the plaintiff, and said: The plaintiff, Mr. George Robins Booth, is a practical chymist, who for some years has turned his attention to improvements for the prevention of smoke, the generation of heat, and the manufacture of gas. The first patent under which he claimed in this action, was taken out in 1850, and was for an improved apparatus to be applied to the manufacture of gas from oil. Its novelty consisted in suspending the retort by the neck in a "heat chamber," and in making the interior of the retort an inclined plane in steps, or corrugated. By this means a greater heating surface and a more equable heat were obtained than under the old system, whereby the oil was dropped on to stones or brick-ends placed at the bottom of the retort, which, instead of being suspended in the midst of fire, rested upon brickwork. The second patent was taken out in 1851, and involved a claim for making gas direct from oleaginous seeds and other vegetable substances, instead of first extracting the oil and then making gas therefrom. According to the plaintiff, gas thus made was purer and better than any other, and it possessed this advantage, that every housekeeper and farmer growing rapeseed could be their own gasmakers, by means of a portable apparatus. The defendant, Mr. Kennard, is a civil-engineer, residing in Duke-street, Adelphi, and the plaintiff alleged that he, carrying on business under the name of the British and Foreign Vegetable Gas Company, had infringed his patents by making and selling an apparatus and materials for the purpose of making gas direct from seeds, the retort in such apparatus being suspended in the same manner as under the plaintiff's first patent.

Mr. G. R. Booth, the patentee and plaintiff, was then called and said that he had applied his attention for many years to the mode of making gas from oil, and had made himself acquainted with all that had been written on the subject, made many experiments, and took out a patent on the 12th November, 1850. In his apparatus the retort is suspended by the neck, which is a new and important improvement, as the heat gets equally at all portions of the retort. The old mode of supporting the retort for oil gas was upon brickwork, placed underneath, and the retort was placed horizontally. It was found that carbon collected on the bottom of the retort and prevented the generation of gas, and one object was to prevent that evil. Pieces of metal, bricks, and stones, were formerly put into retorts to increase the heated surfaces by which the gas was generated, by acting upon the material from which the gas was obtained. That was also abandoned because the quantity of carbon collected stopped up the retort and became fixed to the interior of it, and was frequently so hard that gunpowder would not break it. When the retort rested on bricks, the fire only got at certain portions of it. In his apparatus the retort is suspended by the neck, so that the fire heats all portions of it equally. He also made the sides with inclined and corrugated parts, and thereby got a much larger heating surface for acting upon the material to be converted into gas. The proportion of heating surface under his mode, as compared to the old, is as 576 is to 36 square inches. He made experiments on oleaginous seeds and other vegetable substances, and found that the gas was generated as well from them by the ordinary process of oil-gas making, as from the oil obtained from them, and took out a second patent for that in 1851.

The Chief Baron.—I am decidedly of opinion that the second patent is void, inasmuch as the patentee by it claims the making of gas from seed or any other vegetable substance, by any process whatever. This is fettering skill and genius for fourteen years in a way which the law will not allow. A more simple process might be invented of obtaining gas from seed and the other vegetable substances claimed by the plaintiff, and if the claim in the plaintiff's second patent were good he would be entitled to prevent its use.

Mr. Watson.—If that is your Lordship's view of the case, and the direction you intend giving to the jury, I will tender a bill of exception, so as to have the opinion of the Court of Error upon it instead of occupying time by going through the rest of the case.

The verdict was thereupon taken for the defendant as to the second patent, subject to the bill of exceptions, and, as to the first patent the jury were discharged from giving any verdict by consent of the parties.

HENDRIE'S SILK PATENT:— LAW CASE.

EXCHEQUER, GUILDHALL.
July 6th and 7th, 1855.

Sittings at Nisi Prius for London before Mr. Baron Martin and a Special Jury.

HENDRIE V. JOURDAIN.

SIR F. THESIGER, Mr. Webster, and Mr. Henry James appeared for the plaintiff, and the Attorney General, Mr. Hindmarch and Mr. Bovill for the defendant. Sir F. Thesiger stated the case on behalf of the plaintiff, that this was an action for the infringement of a patent granted to the plaintiff on the 11th May, 1845, for "An improvement in the preparation of silk." The old process was, that hanks of silk, after being dyed and soaked in soap suds, were stretched for a short time and dried by being hung on rods in a perfectly undistended state, whereby the gloss of the silk was not properly brought out. The plaintiff discovered means of imparting a beautiful lustre to the silk by submitting it in tightly distended skeins when damp to the action of heated air or air of the ordinary temperature, in which distended state it remained until dry. This was a simple process, and he invented a machine to carry it out, consisting of different pairs of arms on which skeins or hanks of silk were placed and distended by the arms being screwed out from each other, in which position the hanks remained until thoroughly dry. He found that the effect of this simple process was to impart such a beautiful lustre to the silk that it could be easily detected from that dried in the old way without distension. The plaintiff had been for some time past satisfied that the defendant was infringing his patent, but was unable to obtain any positive evidence from his inability to gain access to the defendant's premises. However, since the Patent Law Amendment Act passed, if a patentee think that his patent is being infringed, on application to a judge, he may obtain an order of inspection. Consequently, in January last, Mr. Hendrie, the plaintiff, obtained such an order, under which two gentlemen were admitted to the defendant's premises, and they found that the machine which he was using consisted of three hollow metal cylinders, heated by steam, two of which are free to revolve, while the third is capable not only of rotation round its axis, but of being drawn apart from the others by means of a powerful screw. Skeins of silk are placed in a damp state over two and under one of the cylinders, the screw is set to work, and one of the cylinders over which the skeins have been placed is drawn away from the others until the skeins are in *state of great tension. The cylinders are* *ade to rotate, and the skeins pass under* and over them until they are dry and have become lustred. The defendant's machine answers in every respect the claim contained in the plaintiff's specification.

The plaintiff and several other witnesses were examined; the plaintiff however admitted, on cross-examination, that a machine which was produced, and which was proved to have been in use at Chorley in the year 1839, before the date of the plaintiff's patent, would be an infringement.

The ATTORNEY-GENERAL then addressed the jury for the defendant, and said that the plaintiff sought to restrain the defendant from the use of a machine which he had used for many years, and which he had not patented, for the simple reason that he did not think it was a novelty; that there was no identity between the plaintiff's and defendant's machines, and therefore there was no infringement; but if there were any similarity in the process, then the plaintiff's is old, and his patent consequently void. The practice of stretching silk, and allowing it to remain in a distended state until dry, was well known and in use in Manchester and the neighbourhood as long ago as 1839.

Witnesses were called for the defendant, who proved that in the year 1839, prior to the date of the plaintiff's patent, they had used at Chorley a machine to stretch silk, and keep it in a state of tension while drying. This machine was produced in Court, and consisted of an upper and a lower bar on which the silk was placed, and by means of screws these bars were drawn asunder, and thus stretched the silk which was on them.

The ATTORNEY-GENERAL was proceeding to call further evidence, when Sir F. Thesiger said that the production of the machine from Chorley was so strong against his case, that he was not prepared to answer it, and he would therefore submit to a nonsuit.

Plaintiff nonsuited.

NORMANDY'S SOAP PATENT.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Present: — *The Right Honourables Lord Justice* KNIGHT BRUCE, *Lord Justice* TURNER, *Mr.* Pemberton Leigh, *and Sir* Edward Ryan.

ON Monday, July 16, an application was made on behalf of Dr. Normandy for the prolongation of a patent granted to him in September, 1841, for "certain improvements in the manufacture of soap," which improvements consisted in the introduction of sulphate of soda, the effect of which was materially to improve the quality and usa-

[redacted]

fulness of soap made from inferior kinds of grease and resin, known in the trade under the name of "weak goods." The sulphate of soda also allowed of soap being made of materials which could not otherwise have been used as hard soap, and which being exceedingly cheap, the price of the manufactured article was thereby much diminished. Within two years after the patent had been obtained it was said to have been rendered comparatively useless, on account of an order of the Board of Excise restraining the making of soap by this process without subjecting it to the highest rate of duty, in consequence of which Dr. Normandy was obliged to submit to the loss of his patent, and of the licenses he had granted. He afterwards remelted soap, duty paid, and with the permission of the Board of Excise introduced the sulphate of soda; but that permission was withdrawn the following year. In 1852 he was allowed to resume the manufacture, since which a few licenses had been granted.

Sir F. Thesiger and Mr. Bramwell appeared in support of the application.

Evidence having been given to show the public importance of the invention, and the loss sustained by working the patent,

Their Lordships granted an extension of the patent for three years.

JUCKES' FURNACE PATENT.

On the day mentioned in the preceding case, and before the same committee, an application was made for the extension of a patent granted September 6, 1841, to Mr. Juckes, for "improvements in furnaces or fireplaces," and professing to make provision for the consumption of smoke and other carbonaceous matters usually emitted by burning fuel.

Several witnesses were examined to prove the efficiency of the apparatus employed, and its economy in the consumption of fuel.

Mr. Hindmarch appeared in support of the petition.

Their Lordships were of opinion that, considering the utility and value of the invention, a sufficient remuneration had not been obtained, and therefore granted an extension of the patent for three years.

MR. BABBAGE'S OCCULTING LIGHTS:—

THEIR APPLICATION TO PURPOSES OF WARFARE.

At pages 315 and 363 of our sixtieth volume we published an elaborate description of a new system of occulting lights for sea coasts and other purposes, which had been designed by Mr. C. Babbage, and which, in our judgment, possesses merits that should have led to its immediate and general adoption. Mr. Babbage now suggests the application of the system to military operations conducted in the night. He says:—

The failure of the Sebastopol assault on the 18th of June has been ascribed to the mistake of a signal made by the general commanding one of the attacks—the fuse of a shell was mistaken for a rocket, the signal previously agreed upon. One of the most extraordinary features of the present war is the singular neglect by the allies of those aids which a highly advanced state of mechanical science places at their disposal.

The Russians, on the contrary, have for years examined and systematically treasured up every invention which could contribute to their success.

It requires no profound military skill to perceive that, under the peculiar features of the localities around Sebastopol, where combined attacks are directed by two commanders-in-chief, it is important that they should possess, if possible, means of instant communication with each other. It is still more important that each commander should have instant means of conveying orders to the leaders of each of his several attacks. Had this been the case, the mistake of a signal would have produced but little inconvenience, because it might, as soon as perceived, have been rectified. The commanders-in-chief might communicate with each other by a portable electric telegraph; but this instrument could not be used by the advancing troops. A more effective instrument would be some simple telegraph, fixed at the two stations chosen by commanders-in-chief.

During a night attack a very simple form of telegraph might be used, which has already been proposed for enabling ships to communicate with lighthouses or with other vessels; it is called the "occulting telegraph." Its principle is equally valuable for enabling the seamen to read the number of any given lighthouse as soon as it appears above the horizon, or for communicating his own necessity for assistance or the news he brings.

The best lighthouses consist of one argand lamp, surrounded by glasses, which concentrate the greater part of the light in a direction parallel to the surface of the sea. Now, it is well known that if an opaque cylinder is lowered over the glass of an argand burner the light will be entirely hidden. If the shade be lowered, and then quickly raised,

the light will suffer a temporary extinction, which is called an "occultation;" at whatever distance the lamp can be seen this occultation will be perceived. It has been found by experiment that if these occultations succeed each other at about the distance of one second, they can not only be seen, but be easily counted. Here, then, is a ready means of expressing small numbers. To express large numbers, as, for example, 374, it is only necessary to make three successive occultations, and allow a pause of five seconds; make seven successive occultations, and allow a pause of five seconds; make four successive occultations, and allow a pause of twelve seconds. After this the series may be repeated.

Thus the number 374 can be communicated to all within sight of the lamp in little more than half a minute. One great advantage of this system of signals is, that the number can be repeated by mechanism until it is acknowledged to have been observed. In the case of a lighthouse, the same number must be repeated from sunset to sunrise. Another advantage is, that this kind of telegraph is adapted to all existing numerical codes of signals. During the day the light of the sun itself might be used for an occulting telegraph. The distance at which sunlight could be employed might, under favourable circumstances, extend to about 100 miles.

In 1851 an occulting light was publicly exhibited in London. The plan was at that time communicated to the Trinity-house.

Occulting lights were subsequently approved by the Light-house Board of the United States, and Congress appropriated 5,000 dollars to make experiments upon them.

I have also evidence that the occulting system of lights was known at St. Petersburg in 1853, and I infer that it has been practically applied at Sebastopol from the following extract from the letter of the *Times'* correspondent at Balaklava—(See the *Times*, Wednesday, July 11):—

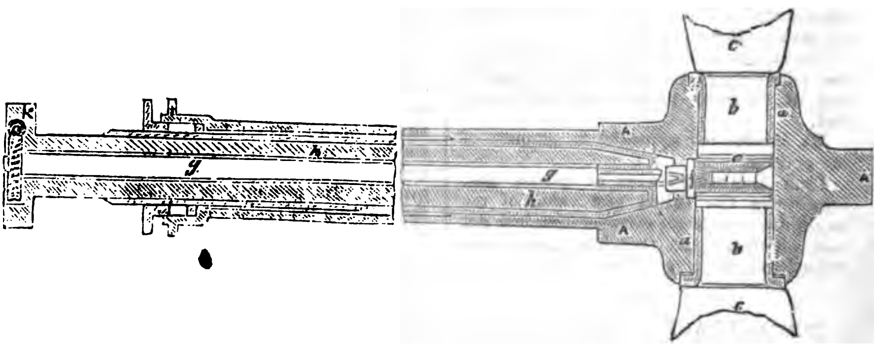
"A long train of provisions came into Sebastopol to-day, and the mirror telegraph, which works by flashes from a mound over the Belbeck, was exceedingly busy all the forenoon."

This can scarcely apply to any other than an occulting telegraph.

WAIN'S PATENT FEATHERING SCREW PROPELLERS.

Mr. W. Wain, engineer, of Southwark, patented on the 16th of October, last year, an arrangement of screw propeller in which the blades may be adjusted from the engine room of the vessel. Fig. 1 of the accompanying engravings represents a sectional elevation of a screw propeller constructed according to his invention, and attached to the propeller shaft; and fig. 2 is an elevation of the inner end of the propeller shaft and the apparatus used for giving an axial motion to the blades of the propeller. *a a*

Fig. 1.



is the boss of the propeller, cast in one piece, with an opening through it to receive the stems, *b*, of a pair of propeller blades, *c*, which are capable of being set to any required angle to suit the run of the vessel. The gearing for effecting this adjustment is contained within the boss, *a*, and is therefore not liable to injury or disarrangement from external circumstances. These stems are set in conical bushes, *d*, made in two halves, and bolted to the boss, *a*, and, in consequence of the inner edge of these bushes

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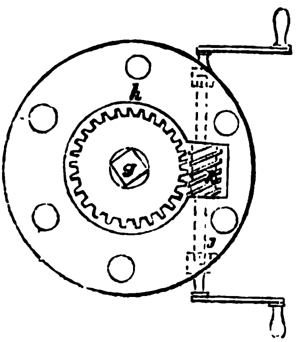
bearing against a shoulder on their respective stems, they will hold the blades securely in their place, while at the same time they afford a ready means of tightening up the stems in their sockets when they have worked loose by wear. The stems at their inner ends lock into each other when (as in the case shown) but one pair of blades is employed, and by this means the strain or leverage upon one blade is counteracted by the resistance offered by the other, so that the tendency of the blades to work loose in their sockets is greatly diminished. The stem of each blade is provided with a ring of bevel teeth, *e*, into which a pinion, *f*, takes, for turning the blades and setting them at any required angle. This pinion, *f*, has its bearing in the propeller boss, *a*, a

Fig. 2.



suitably-shaped recess being formed for its reception; and it is provided with a square socket, into which takes the squared end of a shaft, *g*, which passes out through the stern of the vessel, and is employed for adjusting the blades to the required angle. The rear or inner end of the shaft, *g*, bears against an elastic cushion of India-rubber, and by that means it is pressed forward into the socket of the pinion, *f*, and at the same time causes that pinion to work in close contact with the bevel teeth, *e*. The propeller boss is provided with journals, A A, which are carried by suitable bearings as usual. The propeller receives its motion from a hollow shaft, *h*, through which the shaft, *g*, passes, and in which that shaft has its bearings. In the propeller boss a square socket is formed to receive the square end of the shaft, *h*, which projects out at the stern of the vessel. The other or inner end of the shaft, *h*, is connected in any convenient manner to the driving shaft of the engine. The inner end of the adjusting shaft, *g*, is feathered to receive a worm-wheel, *i*, which fits into a recess formed for it in the end of the shaft, *h*. Gearing into the worm-wheel, *i*, is a worm, *k*, carried by a spindle *j*, which has its bearings in the flange of the hollow shaft, *h*, as shown in the end view, fig. 2. By means of a key or winch-handle applied to either end of the spindle, *j*, rotary motion is given to the worm, which, taking into the worm-wheel, will turn the shaft, *g*, and thus impart an axial motion to the pinion, *f*; but as this pinion is in gear with the rings of teeth, *e e*, on the stems of the propeller blades, these blades will at the same time be caused to turn in their sockets, and assume any required angle with respect to the driving shaft. In order to unship the propeller, the shafts, *g* and *h*, are drawn back into the vessel until they are clear of the boss of the propeller; the propeller may be then unshipped in the usual manner. As in some cases it may be found desirable to shorten this sliding movement of the shafts as much as possible, the inventor proposes to give the adjusting shaft, *g*, an independent sliding motion. This is effected by providing in the abutting end of the driving-shaft a recess to receive the end of the shaft, *g*, and forming upon the shaft, *g*, a circular rack, into which gears a pinion carried by the hollow shaft. When this pinion is turned, the shaft, *g*, may be slidden backward until its outer end is drawn within the hollow shaft, *h*. The two shafts may then be drawn back together free of the propeller boss. The inventor suggests that, for the purpose of ascertaining the angle at which the blades are standing at any given time, it may be found convenient to employ an index apparatus which shall receive its motion from the spindle, *j*, and thereby determine the amount of axial motion that has been imparted to the adjusting-shaft.

POLLUTED STATE OF THE THAMES.

Since the publication of the observations made in our last number on this subject, the following remarks, by a gentleman residing at Chelsea, have appeared in the *Times*:

"There is no doubt that during the late dry weather the Thames has been in a worse state than usual; but what Professor Faraday stated, as something extraordinary, has been existing the last six weeks.

"I do not speak judging from the appearance of the water while passing up and down the river in a steamboat; but, being connected with a manufactory that pumps up from the river 30,000 to 40,000 gallons per day, I know as a fact that that quantity of water deposits in a tank of 1,200 square feet area, by a partial subsidence only, a thick, black, fetid mud, half an inch in

depth over that surface during the period of three days.

"Officials belonging to the water companies may, perhaps, say, 'That is the water direct from the river; but we filter what we supply to the public.' In reply, I will state another fact, that a stream of water through an inch and a half pipe, supplied from a company, is passed through two fine sieves, in order to keep back any impurities, and that those two sieves have to be cleansed about once in the hour, and the produce would frequently fill a breakfast-cup, of a compost of mud, slime, fibrous matter, and white and red worms, varying from a quarter to three quarters of an inch in length. I do not say it yields that quantity every hour, as it varies; occasionally for two or three hours there is scarcely anything, then as much as would fill a wine-glass, and so on; but that is what a large company supplies the people of this city with as a wholesome drink.

"The water from Thames Ditton and above the locks will, doubtless, be purer; but every gallon taken from that source has this drawback, that it leaves so much less to flush the bed of the river at low water; an important fact, I believe, overlooked, and therefore the greater reason why some plan should be adopted to intercept the flow of the drains into the river.

"I have kept some of the black mud from the tank in a glass vessel for forty-eight hours, and it is now in a full state of fermentation, throwing up a greeny-brown frothy head."

Since the above has been in type, the City Solicitor has been instructed by the Lord Mayor, who is Conservator of the river Thames, to take immediate measures to ascertain to what cause the exceedingly polluted condition of the river is attributable, and to make him acquainted with what appears to be the most expeditious and effectual means of diminishing the virulence and danger of the nuisance. "I am desirous that on such an occasion no time should be lost, and that, with the view to check the evil at once, all other matters on which the principal officers of the corporation may be at present engaged stand over until the necessary investigation takes place." His Lordship was understood to allude to a statement made in the public press, to the effect that the proprietors of the Brent Canal had greatly increased the pollution of the river, by throwing the mud and refuse of that canal into it.

The City Solicitor said, the Lord Mayor's officers should immediately act upon his Lordship's directions, and if it turned out to be as stated, that the proprietors of the Brent Canal had thrown the mud and refuse of the canal into the Thames, and that the present condition of the river was at all attributable to that cause, proceedings should be immediately taken to repress the evil and punish the offenders. He, however, feared the cause of the fetid smell emitted from the river at the present time must be attributed to more extensive and more permanent causes than the clearing of the canal. The river was now the legalized sewer for a population of above 2,000,000. For centuries, while the metropolis was not one-half of its present size, and up to the year 1847, a system of cesspool drainage was in use throughout the metropolis, and the inhabitants were positively prohibited from connecting them with the sewers that had their outfalls into the Thames; but by recent Acts of Parliament, for sanitary reasons, cesspool drainage had been prohibited, and the inhabitants were compelled by law to pass their house refuse by means of the sewers into the Thames. At the time those Acts were passed, Parliament had it in contemplation to enforce the construction of intercepting sewers, to convey the house drainage of both sides of the river into the Thames, sufficiently low down to prevent the tide from bringing back any portion of the polluted water. The proper order of proceeding had been inverted; the intercepting sewers were not even yet commenced, while, for the last three or four years, the pollution of the Thames water had been increasing.

It has subsequently been stated by the Lord Mayor, that he has not power to take any steps in this matter, and he recommends that an Act of Parliament be prepared to meet the case.

SCIENCE AND THE GOVERNMENT.

We had occasion last week to comment on the miserable allowance doled out to men of science and literature by the government of this wealthy country, with reference to the distribution of pensions out of 1,200*l*., annually granted by parliament for the reward of distinguished services. Another, and if possible a more flagrant case of the disregard by government of the claims of science has recently come to our knowledge. In 1849, the Earl of Rosse, then President of the Royal Society, received a letter from Lord John Russell informing him that it was the intention of her Majesty's government to place 1,000*l*. at the disposal of the President and Council of the Royal Society for the promotion of science. Of course, no specific pledge could be given that this sum would be granted annually, yet there

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was every reason to hope, and indeed believe, that the grant would be continued. Accordingly, the Council of the Royal Society unanimously agreed to accept the liberal offer of government, and a large committee, consisting of all the members of council and the most eminent scientific men, was appointed to consider and report upon the best mode of applying the grant. After several meetings, it was recommended:—First, and chiefly, that the grant be awarded in aid of private individual scientific investigation. Secondly, in aid of the calculation and scientific reduction of masses of accumulated observations. Thirdly, in aid of astronomical, meteorological, and other observations, which may be assisted by the purchase and employment of new instruments. Fourthly, and subordinately to the purposes above named, in aid of such other scientific objects as may from time to time appear to be of sufficient interest, although not coming under any of the foregoing heads. In accordance with these judicious recommendations, the grants for the years 1850, 51, 52, 53, and 54 have been distributed to the great benefit of science. Among the eminent persons whose scientific investigations have been promoted by grants from this fund may be mentioned Professor Owen, Colonel Sabine, Professor Stokes, the Astronomer Royal, Dr. Carpenter, Professor Hopkins, Mr. Horner, Prof. Miller, Dr. Tyndall (who at his Lectures before the Royal Society and the Royal Institution acknowledged how greatly he was indebted to this grant for enabling him to purchase foreign instruments essential for his investigations), Mr. Huxley, and Mr. De la Rue. These names alone are sufficient guarantees that the money has been applied to the best objects—and we have reason to know that in many instances experiments have been made which have produced results productive of such national advantages as will in a commercial point of view alone repay the sum expended over and over again. We particularly allude to the important experiments by Messrs. Fairbairn, Hodgkinson, and Hopkins, on the strength of materials used in engineering works, which have been and are carried on by those gentlemen without further cost than the mere expense of the machinery and raw materials. It will scarcely be credited, that government, while calling into requisition the gratuitous services of the Fellows of the Royal Society for the benefit of the nation, has refused to continue this year the grant of 1,000*l.* Apart from the blow to science which this refusal strikes, is it wise policy to declare in the face of nations that England, with her vast resources, is yet so stricken by the war that she can no longer devote 1,000*l.* a year to the promotion of science? This, indeed, will be news for the Czar, who, with a deficient exchequer, continues to endow his famous Metropolitan Academy of Sciences. We hold that the withdrawal of this grant is as unjust as it is impolitic. Government has never been backward in requesting scientific aid from the Royal Society. A few months only have elapsed since it called upon the Society to give their opinion as to what are the great meteorological desiderata with reference to a government department for meteorology, which it was proposed to establish for the advantage of navigation. This request was immediately responded to. Circulars were addressed to eminent meteorologists and men of science at home and abroad; and, after long and laborious deliberations, a voluminous report was drawn up and transmitted to government. All this time and labour was, be it remembered, *given gratuitously*, by men who are not the best able to make a present of their time and valuable knowledge. It is scarcely creditable to the state that such sciences should be rewarded by the withdrawal of the annual grant.—*Athenæum.*

The Ascent of Mont Blanc. A Series of Four Views printed in Oil Colours, by George Baxter, *the Original Sketches and the Description by* J. Macgregor, Esq., M.A.

Mr. Baxter's beautiful process of printing in oil colours has certainly been applied to the illustration of no subject with more gratifying effects than those produced in this series of views depicting a recent ascent of Mont Blanc by Lord Killeen, Col. de Bathe, Messrs. Albert Smith, Russell,* Macgregor, Shuldham, Fanshawe, and Burrowes, accompanied by about forty guides. As these views, which have for some time been conspicuous in the windows of many respectable print-sellers, must have already attracted the attention and admiration of our readers, we need not point out their extraordinary merits as specimens of Mr. Baxter's process. Apart, however, from Mr. Baxter's share in their production, they possess considerable interest as faithful and well-executed representations of the scenes actually presented to those of the courageous company above enumerated, who persevered in their determination to ascend to the "bald awful brow" of "sovereign Blanc." Mr. Macgregor, of the Temple, to whose artistic skill the public are indebted for the production of the original sketches, and by whom they were gratuit-

* This gentleman has since signalised himself by his descent into the deep miseries of last winter's campaign in the Crimea, and his remarkable descriptions of that campaign in the Times.

ously placed in the hands of Mr. Baxter, has written a series of descriptions of remarkable merit, which should be perused by all who wish to fully appreciate and enjoy these views. From these descriptions, as an incentive to the perusal of the whole, we quote the following passage with which they conclude:

"Oh, it was lovely, fair, and still, when first I gained the summit. The smoke puffed from the cannon firing at Chamouni; and only fancy, the telescopes were manned by young ladies, staring even from Geneva, fifty miles away! Shuldham and his people gave a jejune cry as they successively came up, and thought they were cheering. Common talk could not be heard at all; loud shouting sounded as a voice below a feather bed, and the pistol we did *not* bring with us makes a report like a popgun.

"The highest point in Europe. More earth to be seen from hence than ever again by any of us! Yet anon, we are in a 'reverie' and behold all without seeing anything. Arouse! for it is a view beyond description. Look quickly, for you must soon go down. Very well then, where's the champagne? Let's feast on that wretched fowl's body, whose case has been reserved for discussion before this high court.

"From a leathern cup, we quaffed to the Queen's health what hissed and brightly sparkled like bubbling fire.

"Another noiseless pause. Lonely silence like this, oh, how it speaks to the heart! Here you see a hundred, there two hundred miles; but we cannot look, sudden reaction had made us utterly passive, calm, weary, quiet, and smiling. Life seemed a dumb brightness, nor pain nor pleasure; but a mute dazzling thing, with dreamy half-closed eyelids. All could have slept in that awfully still sunshine, and peacefully died. It was warm, gleaming rest, silent, white, and happy; and why not lasting? Awake! and behold this coloured map around us.

"There is Italy, and the Grand Duke weeding the bookstalls. We can't see King Bomba of Naples, for he is inspecting his prisons. The Pope is in secret consistory, also invisible. Look at France; brave ally, we greet you! That dim blue line is Austria, but the atmosphere is not free thereabouts. Bravo! little Switzerland, you look as large from this as Zwinglius made you!

"One sees more inwardly than even through the eye of Mont Blanc.

"Then I stamped my foot, and the icicles rattled like razor-fish on the shores of the sea; mild radiance around, and below, the deep, deep pure eternal snow.

"Man never looked so great to me or the world so small. The spectacle was too grand *to be uttered;* but the memory of it can never be effaced. Miserable, he who could grudge his toiling to enjoy this!

"If thoughts are lofty, according to our height above the plain, then could we surely hope from this white pinnacle of Europe to 'look through nature up to nature's God.'

"Not so! This glass of nature is but a shattered one, dimmed by the stains of ages of man's guilt, and broken by his fall. Mount not, but stoop, and you may surely see revealed what man cannot 'by searching find out,' even from the summit of Mont Blanc."

SPECIFICATIONS OF PATENTS RECENTLY FILED.

LOYSEL, EDWARD, of Rue de Grétry, Paris, France, civil-engineer. *A new game combining chance and skill, and the apparatus to be used therewith.* Patent dated December 22, 1854. (No. 2707.)

The inventor describes a game which he calls the chivalric game of Fournoy, in which the piece to be moved is not selected by the player, as in chess, but is pointed out by a mechanical indicator, the player determining what is the best move to be made with the piece indicated.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in electro-magnetic engines.* (A communication.) Patent dated December 22, 1854. (No. 2708.)

In the improved engine, four or more electro-magnets are combined in pairs, so as to present their poles towards a common centre, leaving a space between them to admit an axis which is connected with one of the poles of the actuating battery, so as to form a part of the galvanic circuit, and is carried at its two ends upon the frame of the machine, being capable of rotating freely under the action of the magnets upon levers attached to the axis. At the points where the ends of the magnets approach the axis, pieces of brass or other non-magnetic material are interposed, to prevent the action. On each side of the brass collar arms or levers are arranged upon the axis, and between each two of these levers the ends or legs of the magnets are allowed to pass.

BAUDOUIN, FELIX MARIE, of Paris, France. *Improved means of isolating and testing the isolation of the wires of electric telegraphs.* Patent dated December 22, 1854. (No. 2710.)

Claims.—1. A method of insulating telegraphic wires by means of fatty varnishes and bitumens to be used as coatings, especially by applying alternate layers of said coatings and of a fibrous matter. 2. A method of insulating such wires by means of

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bitumen used either as cements or puddings, which are solidified by cooling, or by working it into multitubular blocks in which the wires are inserted, but not fixed, or else by running it in blocks or courses in which the wires are buried. 3. The method of combining the first method of insulation with any other means. 4. Certain described apparatus for straightening and stretching the wires. 5. The use of stops, guides, or combs, with cross-hinged or other pieces, or their equivalents, for holding the wires apart till the bitumen has solidified, such combs being then withdrawn; also of guides, diaphragms, or supports made of bitumen or other insulating substance, these guides, &c., being left in the block of bitumen which is run over and between them. 6. The mode of testing such wires by means of openings, boxes, or pits, constructed in such manner as to insulate the wire passing through them, and of galvanometers which are connected to the line wires and placed at regular distances in such boxes, or on the telegraphic line, a magnetic needle being placed in the opening of the galvanometer so as not only to indicate the existence or cessation of the current, but also to measure its intensity.

PORTER, JOHN FRANCIS, of Besborough-street, Middlesex, civil engineer. *Improvements in the manufacture of bricks and tiles.* Patent dated December 23, 1854. (No. 2714.)

This invention consists of improvements upon machinery patented by the inventor Oct. 11, 1853 (see *Mech. Mag.*, vol. lx., p. 402, No. 1608), and comprises a particular combination of the parts of the machine; certain means by which the mould table is traversed; an arrangement of lubricating apparatus; a mode of inserting the scrapers in the mouthpiece or chamber; a mode of forming the indentation in the brick by means of one piston fitted within another, or by withdrawing part of the pallet only at one operation, thus allowing the air to enter more easily between the pallet and the surface of brick lying thereon; or by a successive withdrawal of the pallet in parts by which the surface of the newly-formed brick adhering to the pallet is divided into parts, and the suction caused by the adhesion of the clay to the pallet is overcome; a method of liberating the moulded article from the pallet when the article is formed with a flat surface; and a certain combination of a mould frame, with rollers for filling the mould and compressing the clay within it, the compression being completed before the mould is removed from beneath the chamber.

ANDERSON, GEORGE, of the Gas-works, Rotherhithe, Surrey, gas engineer. *Improvements in purifying sewers and buildings, or other places, of noxious vapours.* Patent dated December 23, 1854. (No. 2715.)

This invention consists in withdrawing the noxious vapours from sewers by means of an exhausting apparatus, and forcing them into combination with suitable deodorizing matters.

HENFREY, CHARLES, of Turin, Sardinia, civil engineer. *Improvements in the construction of railways for steep gradients, and in the machinery or apparatus employed therein or connected therewith.* Patent dated December 23, 1854. (No. 2718.)

The improvements consist in employing water as a propelling force. A stream of water is directed down the line of railway in one or more channels, situated either between the rails or on either side of the same, and acting upon a locomotive water-wheel, or upon other mechanism attached to the locomotive.

DE LA RUE, WARREN, of Bunhill-row, Middlesex, manufacturer. *Improvements in treating products arising from the distillation of a certain tar or naphtha, to render the same suitable for dissolving or removing fatty or resinous substances.* Patent dated December 23, 1854. (No. 2719.)

The object of this invention is the preparation of certain very volatile and nearly odourless products from Rangoon tar, or Burmese naphtha, or petroleum, in order to render them applicable to the purposes of dissolving resinous or fatty bodies, or removing greasy or resinous stains from leather, woollen, silk, cotton, or linen fabrics.

WHITE, CHARLES EDWARD, of Fulham, Middlesex, gentleman, and FRANCIS ROBINSON, of Putney, Surrey, gentleman. *Improvements in signalling for railway purposes.* Patent dated December 26, 1854. (No. 2721.)

This invention is another of that class in which railway signals are produced by means of compressed air forced through sounding pipes and whistles.

BISHOP, BENJAMIN, and JOSEPH DYER, of Birmingham, Warwick. *Improvements in the manufacture of hinges.* Patent dated December 26, 1854. (No. 2722.)

Claims.—1. "Casting the parts forming the knuckles of hinges open, which knuckle parts are afterwards to be bent into form in contradistinction to the common mode of casting the knuckles solid." 2. Coating iron hinges, formed in the foregoing manner, with deposits of copper or brass.

THOMAS, FREDERICK SAMSON, of Hook's Villa, Fulham, Middlesex, and WILLIAM EVANS TILLEY, of Kirby-street, Holborn, Middlesex. *An improved process for plating or coating lead, iron, or other metals with tin, nickel, or alumina.* Patent dated December 26, 1854. (No. 2724.)

This invention was described at length on page 4 of No. 1665.

Dundas, James, of Dundas Castle, Linlithgow, North Britain, engineer. *Improvements in the manufacture of cannon and ordnance of every description.* Patent dated December 26, 1854. (No. 2725.)

The inventor brings together a number of longitudinal staves of iron, the inner surfaces of which form the bore of the cannon, and the sides of which lie close together. These, when together, he temporarily hoops, and then turns down their outer surfaces so that they are fitted to receive accurately bored hoops which are shrunk upon them throughout their length, and which are afterwards turned down to the form of the outer surface of the cannon.

Nash, John, of Market Rasen, Lincolnshire. *Improvements in the means or process of drying malt, grain, or roots.* Patent dated December 27, 1854. (No. 2726.)

This invention consists in making use of hot water and hot air, or the former only, supplied through suitable pipes, for the purposes named in the title.

Carter, George, of Lombard-street, London, gentleman, and Henry Cyrus Symons, of Castle-street, Southwark, Surrey, engineer. *Improvements in boilers and furnaces, and in the apparatus for supplying and regulating the fuel, air, water, and steam.* Patent dated December 27, 1854. (No. 2727.)

This invention consists—1. In constructing the boiler so as to give greater strength and heating surface by means of plates or rods passing through the boiler plate, such plates being joined to other pieces, forming a cross; or the cross may be in a solid piece, and be riveted to others, or connected to others by curved or angular pieces. 2. In connecting the internal valves of the feed pump attached to the boiler to an external rod or lever, whereby, in case of derangement, they may be started with facility, so as to continue the constant supply of water. 3. In indicating the quantity of water by a tube passing through a hole or stuffing box, and having on one end a steam whistle, and on the other a float which moves the tube and allows the steam to escape through an opening in it and in connection with the steam whistle. (When it is preferred to place the water gauge outside the boiler a communication is made with a water vessel to which is attached a beam or spindle having an arm upon it to indicate the water level, or to actuate a slide or cock which on being opened will allow the steam to escape through a whistle.) 4. In indicating and regulating the pressure of steam by a tube sliding through a stuffing box, and having its ends made steam tight and pressed by a spring or other instrument, so as to cause a sliding motion as the steam pressure varies; by connecting this tube with the damper the draught and heat of the furnace are regulated. 5. In the application of the expansive properties of metal to the working of valves. A rod is placed over the fire and passes through the boiler and water, and when this rod is expanded by over-heating its loose end presses a lever which opens a safety valve. 6. In supplying fuel to the fire by means of fire bars having one edge resting on central bearings, and the other edge movable. By alternately raising and depressing these bars in succession, the fuel is forced forward and consumed. The fire-bars are connected underneath by gearing which may be worked by manual or machine power. 7. In admitting air into any desirable part of a furnace through a series of metal or fire-ware plates, rings, tubes, or discs, having grooves or channels on their sides for the air to traverse, before it is emitted from their ends or edges in numerous jets. 8. In an improved apparatus for allowing the air to enter freely for a certain period after firing, and for then shutting it off gradually.

Boyle, Thomas, of Skinner-street, Snow-hill, London. *Improvements in reflectors for artificial light.* Patent dated December 27, 1854. (No. 2728.)

Claim.—The manufacture of reflectors for artificial light, by combining in suitable frames separate pieces of glass readily capable of being separated from each other and from the frames.

Dunn, John Lang, of Glasgow, Lanark, manufacturing chemist. *Improvements in working up certain waste sulphates and nitrates, and for the manufacture of useful products therefrom.* Patent dated December 27, 1854. (No. 2729.)

The inventor says, "in the case of nitrate of copper I take the acid, after it has been used for etching surfaces of copper, and place it in a wooden vat, and dilute it with water until it marks 56° of Twaddell. I then add litharge to the extent of half the weight of the diluted liquid. This mixture is allowed to stand about a week and it should be stirred up about a dozen times each day. I prefer heating this mixture by steam, which I blow into the vat through a wooden tube, by which means the process is accelerated. When a white deposit of nitrate of lead forms round the side of the vat this part of the process is complete. The liquid is now drawn off by a syphon into another vat, and any litharge which remains is worked up by the next quantity of liquor operated on. Molten lead, in quantity equal to that of the litharge used in the first process, is added to the clear liquid which has

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been syphoned off. After a few days the liquid becomes of a light straw colour. The precipitated copper is removed and washed and may be sold as copper or redissolved to form its salts."

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improvements in looms for weaving.* (A communication.) Patent dated December 27, 1854. (No. 2730.)

The improvements which constitute this invention relate, first, to a mode of lifting and lowering the shuttle boxes by an improved arrangement for connecting the lifting rod of the shuttle box with the pin pattern wheel; and, secondly, to a mode of attaching the picker to the top of the staff in such manner that the picker projects laterally from the staff and enters the shuttle boxes.

COMSTOCK, JOHN, of New London, Connecticut, United States of America. *Improvements in trip-hammers.* Patent dated December 27, 1854. (No. 2731.)

This invention consists in so applying a loose belt, with cams and other parts, that a forging hammer can be brought to strike heavy or light blows, or the hammer be entirely stopped, while the driving part continues its motion.

WILLIAMS, MARGARET, of Chelsea, Middlesex. *Improvements in suspending swing looking or dressing-glasses.* Patent dated December 28, 1854. (No. 2735.)

Claim.—The adaptation of springs to the knobs, pillars, frames, or axes of swing toilet and other looking-glasses.

COCKCROFT, JOHN, of New Accrington, Lancaster, machine-printer. *Improvements in machinery or apparatus for printing woven or textile fabrics and yarns.* Patent dated December 28, 1854. (No. 2736.)

This invention consists of an arrangement and application of the calico or grey piece by which the inventor is enabled to dispense with the endless woollen mackintosh or cotton blanket, now generally used in printing calico and other fabrics.

HAWORTH, PETER, of Manchester, Lancaster, currier and leather dealer. *An improved belt, band, or strap fastener.* Patent dated December 28, 1854. (No. 2737.)

Claim.—The application and use of three ridged or permanent fixed lots or loops, formed by certain bars, and secured to the back of the front plate of fasteners as described.

MURDOCH, JAMES, of Staple-inn, Middlesex. *Improvements in waterproofing woven fabrics.* (A communication.) Patent dated December 28, 1854. (No. 2739.)

"I proceed," says the inventor, "as follows: to 3 gallons of filtered water I add ½ lb. of alum, 1 lb. of ox-gall, and 2 lbs. of linseed cake, and boil the mixture for an hour, then filter it and allow it to cool. I then apply this preparation to the fabrics by a brush or by steeping them therein and when the fabrics are sufficiently coated I put them in a stove to dry. I next take 3 gallons of linseed oil and boil it over a strong fire and mix with it ¼ lb. of tar, ½ lb. of Prussian blue, ½ lb. caoutchouc, ¼ lb. crude litharge, and ½ lb. of lamp black. After the mixture, by continued boiling, is reduced to a proper consistency, I allow it to cool and apply to the aforesaid fabrics one, two, or more layers of it by means of a spreading machine, the fabrics being dried in a stove after each coating of the composition. Lastly, I take 3 gallons of linseed oil, boil it over a strong fire and mix with it 1 lb. of Prussian blue (or such colour as I intend to use), 2 oz. of solution of tin and 2 oz. of white copperas. After the mixture has, by continued boiling, become so thickened that it ignites readily and gets glutinous I allow it to cool and with this composition I coat the aforesaid fabrics and dry them as before, and if necessary I give a thin coating of a solution of copal." The fabrics should be smoothed with pumice-stone once or twice between the applications of the coatings.

WARD, WILLIAM, of Sheffield, York, lead chaser. *Improvements in stoves.* Patent dated December 28, 1854. (No. 2740.)

These improvements consist in forming radiating bars with two uprights, one at the back end of it, and the other more or less forward, so that when a set of these radiating fire-bars are laid in their places they will, by their several uprights, form a basket or fire-place for the fuel, and the front parts of the radial bars will project beyond this basket or fire-place and cover the hearth as heretofore.

GRAY, JOHN, of Strand-street, Liverpool. *Improvements in adjusting compasses on board ships or vessels.* Patent dated December 28, 1854. (No. 2741.)

"Heretofore the compasses in iron ships have been adjusted," says Mr. Gray, "by permanent magnets fixed in such positions as to cause the compass to give correct indications at the time of adjustment, but should any of the magnetic conditions of the ship afterwards change the indications are no longer correct. Now, my invention consists in arranging the correcting magnets so that they may be moved in any direction by screws, or racks and pinions, or otherwise."

BENSON, GERD JACOB, of Christian-street, St. George's-in-the-East. *An improvement in refining sugar.* Patent dated December 28, 1854. (No. 2742.)

This invention relates to that part of the

refining process which consists in dissolving sugar in water in order to produce syrups, and the inventor carries on the refining process at a lower temperature than that employed in the present process where free steam is used to "blow up." The invention mainly consists "in employing numerous streams of air, introduced below the sugar and water when in a suitable open vessel or pan, and heated by pipes having steam or hot fluid within them. For this purpose it is preferred to employ a series of perforated pipes near the bottom of the pan or vessel and above them to have a series of heated pipes capable of being raised out of the fluid."

NASMYTH, JAMES, of Barton-upon-Irwell, Lancaster, engineer. *Certain improved machinery or apparatus for facilitating the forging of masses of iron.* Patent dated December 29, 1854. (No. 2744.)

These improvements consist of arrangements of hydraulic cylinders and other apparatus, with chains, wheelwork, and pulleys connected therewith and worked by steam or other motive power, by means of which the mass of metal intended to be manufactured may be removed from the furnace to the anvil, and *vice versâ*, and may be raised, lowered, or turned over in either direction, during the process of manufacture.

DIETZ, ANDREW, and JOHN G. DUNHAM, of Baritan, New Jersey, United States of America. *Improvements in mowing and reaping machines, by which the sickle cutting the grain is moved or worked directly by the driving wheel or its equivalent, without the necessity of cogwheels or cranks.* Patent dated December 29, 1854. (No. 2746.)

This invention mainly consists in the application of cam surfaces upon either one or both sides of the driving wheel, or upon an equivalent and additional wheel placed upon the same axle as the driving wheel, and in constructing such cams of a length corresponding to the cutting range of a single stroke of the knife or sickle during the advance and return of the cutter bar.

STANSFIELD, ASHTON, of Todmordon, Lancaster, cotton spinner and manufacturer, and JOSIAH GREENWOOD, of the same place, manager. *Certain improvements in power looms for weaving.* Patent dated December 29, 1854. (No. 2747.)

Claim.—The application, and use of check straps in power looms for weaving, so arranged that by the action of a spring, or other mechanical equivalent, and mid-feather or other suitable apparatus between which the check strap passes, the shifting motion of the check strap may be impeded *or retarded.*

WIDNELL, HENRY, of Lasswade, Midlothian, North Britain, carpet manufacturer. *Improvements in the manufacture of carpets and other textile fabrics.* Patent dated December 29, 1854. (No. 2749.)

This invention consists—1. In printing threads or yarns in such manner as to omit the ground colours of the pattern, which may be separately filled in as required; and, 2. In the adaptation and application to looms of a swinging frame with heddles working at the top for the purpose of forming a shed for the weft to pass through.

PILLANS, JAMES, of Brompton-crescent, Middlesex. *Improvements in the preparation of hematosin and fibrinous and serous matters.* Patent dated December 30, 1854. (No. 2752.)

The inventor takes the clot or coagulated portion of the blood of beasts, presses it, dries it in a drying room by means of currents of hot air, and grinds it. It is then fit for being employed by the Turkey-red and other dyers, sugar refiners, and others who at present use blood in its natural state. The liquid or serous portion of the blood when purified is dried in the same manner, and supplied to the printers of textile fabrics, and the finers of wine.

FANSHAWE, HENRY RICHARDSON, and JOHN AMERICUS FANSHAWE, of North Woolwich, Essex, manufacturing agents. *Certain improvements in the manufacture of various kinds of water-proof garments.* Patent dated December 30, 1854. (No. 2753.)

Claims.—1. "Rendering the entire texture of garments non-absorbent, or wet-repellent, by saturating, impregnating, or closing the pores thereof with caoutchouc or other elastic insoluble gums or compounds, and which may likewise be coated on one or both sides with caoutchouc, or elastic insoluble gums or compounds. 2. Rendering the entire texture of garments non-absorbent, or wet-repellent, by using oil compounds in combination with the coating of the same texture or fabric with India-rubber, &c."

MAYEUR, EUGENE, of Tredegar-square, London, agent for Thomas Piatti, of Port Maurice, in the Sardinian States. *A new hydraulic pump or machine, based on the centrifugal principle, for the purpose of raising, forcing, or exhausting (even muddy) waters or other fluids and applicable to the wants of agriculture, industry generally, and to the salvage of ships.* (A communication.) Patent dated December 30, 1854. (No. 2756.)

In the machine described by the patentee there are four sheet-iron cones, varying in their dimensions, and fitting one within the other, but leaving a space between them. These cones are united by diaphragms. At the lower part, and soldered in four different points, are four arms supporting a piece in which is fitted a vertical shaft, which receives a rotatory movement from a crank.

This shaft, on which the machine rests, and which gives motion to it, carries in the interior of the machine a solid cone of a determined weight, performing the office of a fly-wheel. On the exterior surface of this solid cone, a number of paddles or blades are placed for the purpose of communicating a centrifugal motion to the fluid, and of thus raising it.

PRESTON, FRANCIS, of Manchester, machinist. *Improvements in bayonets, and in the machinery for manufacturing the same.* Patent dated December 30, 1854. (No. 2758.)

Some of the principal features of this invention (which we may describe at length hereafter) consist in making the stop for the lock-ring or motion of bayonets of the same piece as the socket, instead of brazing or screwing the stop to the socket as heretofore; in making the lock-ring or motion of bayonets of run steel, and in increasing the thickness of the lock-ring or motion of bayonets at that part where the depth is diminished for the stop.

DERING, GEORGE EDWARD, of Lockleys, Herts. *Improvements in obtaining motive power when using electric currents.* Patent dated December 30, 1854. (No. 2759.)

This invention "consists in applying that law which was discovered by Œrsted, that a magnet, when free to move in the neighbourhood of a wire or other conductor through which a current of electricity is passing, will have a tendency to place itself at right angles to the conductor," to the obtaining of motive power.

NORTH, ROBERT SAM, of Gorton, near Manchester, Lancaster, engineer. *Improvements in switches and crossings for railways.* Patent dated December 30, 1854. (No. 2760.)

This invention mainly consists in attaching the point, point rails, and wing rails to an iron or steel foundation piece, and in making the wing rails and check rails exactly alike, "so that when the wing rails are worn out, by being turned four times, the check rails may be then put on and turned four times, in like manner the worn out wing rails acting as check rails. I accomplish this," says the inventor, "by making both ends of the wing and check rails the same length from the bend, and they may either be fished or connected at the joint by a similar chair to the heel chair, or an ordinary joint chair, or otherwise, as may be preferred," &c.

SLATER, THOMAS, of Somer's-place West, St. Pancras, Middlesex, optician, and JOSEPH TALL, of Crawford-street, Marylebone, tool-maker. *Improvements in the construction of planes, and in cutting apparatus, and in the machinery or apparatus employed therein.* Patent dated December 30, 1854. (No. 2761.)

This invention comprises the preparation of the wood of which planes are made, by subjecting it to the action of steam in closed vessels, then exhausting these vessels, heating and drying the wood, and impregnating it with oil; also the forming of the various parts of planes by means of rotary cutters; a mode of securing plane irons by means of a thumb-screw and bracket piece; the application of certain expanding tools to the cutting of the grooves in the cheeks of planes; &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in obtaining motive power.* (A communication.) Patent dated December 30, 1854. (No. 2762.)

This invention consists in employing a long cylinder fitted with a piston which is acted upon on one side by any elastic force, such as that of steam, compressed air, or any expansive gas, the other side of the piston being acted upon by a column of fluid, which is also acted upon by compressed air or other elastic material contained in a vessel in connection with that end of the cylinder.

HUGHES, BERNARD, of Donegal-place, Belfast, Ireland. *The better and more effectual heating of bakers' ovens.* Patent dated December 30, 1854. (No. 2763.)

In carrying out this invention the flame and heated gases from the fireplace are conducted under the sole or floor of the oven by a serpentine flue (provided with a damper), and by means of a vertical flue made in the brickwork eighteen inches from the side of the oven, they pass thence up to another curved flue, which is conducted over the top of the oven. This upper flue terminates at the centre, and presents a heating surface to the top of the oven.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GIROUX, BARTHÉLEMY MARTIN, of Liege, Belgium, locksmith and mechanician. *Improvements in the construction of locks.* Application dated December 23, 1854. (No. 2712.)

This invention consists in withdrawing the bolts of locks or in lifting latches "by pushing or pulling the door-knob instead of turning the same." An inclined plane is attached to the axis of the knob and caused to act upon a roller placed in a slot in the bolt; or in the case of the latch, the axis is caused to act upon a cranked lever, and thereby raise the latch.

WALKER, JAMES, of Wolverhampton, Stafford, brick-manufacturer. Certain im-

provements in machinery for the manufacture of bricks, tiles, pipes, and other articles made of clay. Application dated December 23, 1854. (No. 2713.)

This invention consists in the direct application of the elastic force of steam for the purpose of dislodging plastic clay from the receiving chambers of pug-mills employed in preparing and forcing plastic clay into and through dies for the purpose of forming it into bricks, tiles, tubes, or other forms.

McKelvey, John, of Belfast, Antrim, Ireland. *Certain improvements applicable to spinning, twisting, and roving or slubbing flax and other fibrous substances.* Application dated December 23, 1854. (No. 2716.)

This invention consists in substituting for the usual twistles or eyes at the end of the legs of the fliers moveable ones, which are caused by a traverse motion to slide up and down the legs of the fliers, for the purpose of distributing the yarn or material twisted over the length of the bobbin.

Heppleston, Thomas, of Manchester, Lancaster, hat-trimming manufacturer. *Improvements in machinery or apparatus for stretching and finishing silk or woollen yarns or threads in the hank or skein.* Application dated December 23, 1854. (No. 2717.)

The inventor employs a hollow cylinder which is heated internally and caused to revolve, having the hanks previously passed round it, the hanks being also distended over a rod of metal capable of adjustment so that a certain amount of stretch or tension may be given to them. This is accomplished by securing the tension-rod by two connecting links to a cross piece passing through a nut in which works a screw by the revolutions of which the cross head is caused to traverse to and fro. By the aid of the draw-links the rod regulates the strain on the hanks, and a lustre is imparted to the hanks in consequence of the rapid rotation of the heated cylinder.

Dormoy, Adolphus, ironmonger, of Seuillon, near Langres, France. *The manufacture of shovels in iron.* Application dated December 26, 1854. (No. 2720.)

The inventor rolls out bars of iron 3½ inches broad and one-third of an inch thick, so as to obtain pieces which can be joined together in such manner as to produce two shovels at once.

Blythe, Philip Patton, of Upper Wimpole-street, Middlesex, gentleman. *An improved application of materials to the construction of screw propellers.* Application dated December 26, 1854. (No. 2723.)

This invention consists in the application of India-rubber and gutta percha in a rigid state, either separately or combined, or in conjunction with metal or other suitable material to the construction of screw propellers.

Sinclair, The Honourable James, commonly called Lord Berriedale, of Hill-street, Middlesex. *Improvements in machinery or apparatus for washing cloth or yarns.* Application dated December 27, 1854. (No. 2732.)

This invention consists in the employment of revolving arms or blades which are made to rotate rapidly in a cistern containing cleansing liquid. At the extremity of each of the arms or blades is fitted a strip of vulcanized caoutchouc which rubs against the fabric to be washed.

Cumming, John, of Glasgow, Lanark, North Britain, pattern-designer. *Improvements in the treatment or manufacture of ornamental fabrics.* Application dated December 27, 1854. (No. 2733.)

This invention relates to various mechanical arrangements to be used in the treatment or manufacture of woven goods having loose surface threads or flushings upon the back of them, as in the case of "lappet" fabrics.

May, Charles, of Great George-street, Westminster, civil engineer. *Improvements in the manufacture of screws.* Application dated December 28, 1854. (No. 2734.)

In carrying out this invention a pair of screw dies or tools are used, which, in place of cutting out the metal between the threads, are caused to press the metal between them by a succession of intermitted pressures or impacts, the screw blanks being caused to move round on their own axes and advance a short distance when the dies or screw tools are separate.

Threlfall, Richard, of Bolton-le-Moors, Lancaster, machine-maker, and Robert Walker Pitfield, of the same place, mechanic. *Improvements in machinery or apparatus for spinning cotton, wool, or other fibrous materials.* Application dated December 28, 1854. (No. 2738.)

These improvements apply to hand mules and self-acting mules, and consist in the adaptation of a break so constructed as to act when necessary, and at the will of the spinner, upon the back shaft of such mules.

Hill, Henry Charles, of Parker-street, Kingsland, London. *Improvements in portable dwellings, barracks, and similar dwellings, part of which invention consists in rendering such buildings, and also ships, proof against shot or bombs.* Application dated December 28, 1854. (No. 2743.)

This invention consists in constructing dwellings, &c., of a framing similar to what are called revolving or rolling shutters either of metal or wood; also, in constructing such dwellings on the principle of venetian blinds.

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THOMPSON, FREDERICK, and WILLIAM WAGSTAFF, of Pall Mall East. *Improvements in photography.* Application dated December 29, 1854. (No. 2745.)

This invention mainly consists in marking on the back of a glass plate on which a photograph has been taken, or upon one or more separate glass, metal, or other plates placed behind, the outline or form of the object in the photograph with any sort of varnish, cement, or other such material, or with paper, cloth, velvet, &c., and in filling the space within the outline with one or more coats of any suitable material, thereby producing an appearance of relief or rotundity.

BELL, JOHN ZEPHANIAH, of Sandfield-place, Lewisham-road, Kent, gentleman. *Improvements in the manufacture of boots and shoes.* Application dated December 29, 1854. (No. 2748.)

As there were no drawings deposited with the provisional specification of this invention, although the whole of the description given makes reference to drawings, we are not able to ascertain the nature of the improvements, and we are at a loss to know how the Law Officer who examined the specification was enabled to assert that it contained a sufficient description thereof.

LOYSEL, EDWARD, of Rue de Grétry, Paris, France, civil engineer. *An improved lavement or injecting machine.* Application dated December 29, 1854. (No. 2750.)

In this improved lavement machine the liquid is injected by hydrostatic pressure alone, and the piston springs and other complicated contrivances of the apparatus hitherto employed are altogether dispensed with.

THORNEYCROFT, THOMAS, of Wolverhampton. *Improvements in ship-building.* Application dated December 29, 1854. (No. 2751.)

In carrying out this invention the upper part of the body of a ship above the water line is constructed of bars of wrought iron, which are made to pass in front and at the back of each other, so that a basket or woven work is produced, and is rendered waterproof by timber or planking. Steam pipes are fixed round the bulwarks as a means of attacking boarders.

BISSELL, CHARLES, of Birmingham, Warwick, gun and pistol manufacturer. *Improvements in sights for rifles and other fire-arms.* Application dated December 30, 1854. (No. 2754.)

This invention consists in constructing sights for fire-arms with a graduated scale on each side, marked on two pieces of steel of a bow shape. The sight is hinged to the barrel, and is raised or lowered between the two bow pieces, the inner sides of which have a number of numbered notches, into which the sight clicks as it is raised or lowered.

CHAPMAN, ROBERT, of Manchester, Lancaster, and JOHN MILLER, of Staleybridge, in the said county. *Improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.* Application dated December 30, 1854. (No. 2755.)

This invention relates to "ring and traveller" apparatus, and is a modification of a patent granted to William MacLardy, dated the 12th of June, 1850.

MALLINSÔN, GEORGE, of Manchester, weaver, and HORATIO RIDINGS, of Newton-heath, near Manchester, card cutter. *An improved manufacture of woven fabric.* Application dated December 30, 1854. (No. 2757.)

This invention consists in producing a double fabric which is woven together in such manner that the weft is floated on the face of the upper fabric. The floated portions of weft may be cut asunder lengthwise of the piece to make ribbons or trimmings, or be cut in suitable places to form flounces, or tassels and fringes, or other ornamental articles.

PROVISIONAL PROTECTIONS.

Dated June 7, 1855.

1308. Richard Peters, of Union-street, Southwark, engineer. Improvements in the manufacture of ordnance-shells and other hollow vessels.

Dated June 14, 1855.

1358. Ebenezer Hollis, of Birmingham, Warwick, gun-maker. A new or improved method of securing ramrods to fire-arms.

Dated June 20, 1855.

1407. John Green, of Charlotte-street, Portland-place, Middlesex, gentleman. Improvements in oil-lamps, generally termed moderators.

Dated June 22, 1855.

1431. William Teall, of Wakefield, York, engineer. An improved method of treating and working soapy or greasy matters in order to obtain the greasy substances therefrom.

1435. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in screw-fastenings. A communication.

1437. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in pulverising quartz, mineral, and other hard substances. A communication.

1439. Herbert Newton Penrice, of Woolwich, Kent, captain Royal Engineers. Improvements in machinery for propelling vessels.

Dated June 23, 1855.

1441. Thomas Walker, of Birmingham, Warwick, engineer. Improvements in projectiles for ordnance and other fire-arms.

1443. William Pearce, of the Poole Iron Foundry, Poole, Dorset. Improvements in machinery for manufacturing certain articles of pottery, such as pipes, tiles, hollow bricks, and other like articles.

1444. George Whish, of Canada Works, Birkenhead. Improvements in oscillating steam-engines.

1445. Ignace Joseph Silbermann, of Paris, France. A new system of manufacturing globes and other printed, plane, or curve surfaces.

Dated June 25, 1855.

1447. John Gedge, of Wellington-street South, Middlesex. Improvements in apparatus or mechanism for measuring liquids. A communication from Adolphe Cheron, of Paris, France, engineer.

1449. Josiah Harris, of Clogwynhyfryd, Merioneth, North Wales. A machine and apparatus for crushing, pulverising metals, metallic ores, metalliferous matters or substances whatever, and for obtaining, washing, dividing, amalgamating metals and other matters or substances contained therein. A communication.

1451. Sydney Smith, of Hyson Green Works, near Nottingham. Improvements in apparatus for insuring the correct action of the safety-valves of steam-boilers, and for regulating the action of the dampers of steam-boilers.

1453. Perceval Moses Parsons, of Duke-street, Adelphi, Middlesex, civil engineer. Certain improvements in moulds for casting metals.

Dated June 26, 1855.

1455. Thomas Beatt Sharp, of Manchester, engineer, and Alexander Yorston, of Belfast, Antrim, Ireland, engineer. Improvements in the arrangement and construction of furnaces or fireplaces.

1457. James Ronald, of James'-street, Liverpool, Lancaster. Certain improvements in machinery for dressing manilla, and other hemps and flax.

1459. Benoit Bonnet, of Rue des Couronnes, Belleville, near Paris, France, lace manufacturer. Improvements in weaving.

1461. Charles Marie Pouillet, civil engineer, of Paris, French empire. Certain improvements in railways.

1463. Felix Raux and Louis Poret, merchants, of Paris, France. Improvements in the preparation of artificial mineral waters.

1465. Henry John Distin, of Cranbourn-street, Middlesex, musical instrument-maker. Improvements in the means of rendering the ordinary field or regulation bugle chromatic.

Dated June 27, 1855.

1466. Frederick Russell, mechanic, of Cumberland Market, Regent's-park, Middlesex. An improved mode of hanging windows and shutters.

1467. Thomas Swinburne, of South-square, Gray's Inn, Middlesex, barrister-at-law. Improvements in machinery for applying and obtaining motive power applicable, but not exclusively so, in the propulsion of vessels and railway-trains.

1468. Denis Daniel Buhler, of Paris, France. Certain improvements in the construction of fencings.

1469. Thomas Lucas, of Duston, Northampton. Improvements in the manufacture of iron.

1470. Louis Joseph Frédéric Margueritte, chemist, of Paris, France. Improvements in the manufacture of glass and crystal.

Dated June 28, 1855.

1471. Henry Walker, of Sambourn, Warwick. Improvements in ploughs for ploughing or tilling land.

1472. John Raywood, engineer, of Wentworth, Yorkshire. An improved method of stopping railway-trains.

1473. Charles Moreau-Darluc, of Paris, France, gentleman. An improved mode of separating substances of different nature or composition by means of displacement and substitution.

1475. Simon Davey, of Tucking Mill, Cornwall, safety fuse-manufacturer. An improvement in the manufacture of safety fuses for mining and military purposes.

1476. Carl Christian Engström, lieutenant Royal Swedish Navy, of Buckingham-street, Strand. Improvements in breech-loading ordnance, and the balls or projectiles thrown by cannon.

1477. George Lilley, of Islington, Middlesex, engineer. An improvement in water-meters.

1478. Robert Besley, of Fann-street, Aldersgate-street, London, type founder. An improved manufacture of metallic alloy, applicable to the casting of type and other articles. A communication.

1479. John Skelley, of Kilcurry, Longford, Ireland. Improvements in the construction of carriage-wheels.

1480. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in manufacturing, lighting, and heating gases. A communication.

Dated June 29, 1855.

1481. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in axle-boxes or plummer-blocks. A communication.

1482. Claude Antoine Busson, of Paris, France, engineer. An improved mode of constructing and fixing the teeth of toothed cylinders employed in the treatment of textile or fibrous materials.

1483. Edward Joseph Hughes, of Manchester, Lancaster. An improved method of concentrating the colouring matter of madder, munjeet, spent madder, or any preparations thereof.

1484. Jean Baptiste de Lorenzi, of Paris, France. Certain improvements in the construction of organs.

1485. Henri Dembinski, general, of Rue Joubert, Paris, France. Improvements in the process and apparatus for generating steam without combustible matter, except in accidental cases.

1486. Joseph Eccles, of Blackburn, Lancaster, cotton-spinner. Improvements in the manufacture of bricks, tiles, and other articles made of plastic materials, and in machinery and arrangements or apparatus to be used for the purpose.

1487. John Broadbent, of Manchester, Lancaster, merchant, and Stanley Peter Youle, of the same place, gentleman. Improvements in machinery or apparatus for cutting out the gores of umbrellas and parasols, which said improvements are also applicable to cutting out forms or shapes for other purposes.

1488. William Heaps, of Forton, Lancaster, smith. Improvements in machinery or apparatus for working or cultivating land.

1489. John Weems, of Johnstone, Renfrew, tinsmith. Improvements in drying grain and other substances.

Dated June 30, 1855.

1490. William Woodcock, of Hulme, Manchester, engineer. Improvements in machinery for making bricks and other articles of plastic materials.

1491. Thomas Barling, of Weymouth, Dorsetshire, druggist. Improvements in steam-engine boiler and other furnaces.

1492. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the manufacture or production of manures. A communication.

1493. John Birch, of Bradford, York, furnace-manager. Improvements in the manufacture of iron.

Dated July 2nd, 1855.

1494. William Henry Tooth, of South-street, Southwark, Surrey, engineer. Certain improvements in the machinery for, and in the manufacture of, earthenware and plastic articles, and in the preparation of clays and other materials.

1495. Joseph August Mignon, lithographer and draftsman, of Rue des Postes, Paris, France. Improvements in maps, charts, plans, tables, &c., of great dimensions, to render them more portable and useful.

[redacted]

1496. Francis Lycett, of the firm of Dent, Allcroft, and Co., of Wood-street, London, manufacturers. An improved glove, together with the means of manufacturing the same. A communication.

1497. William Knapton, of Albion Foundry, York, engineer. Improvements in furnaces for effecting the consumption of smoke.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 17th,* 1855.)

469. John Woodley and Henry Herbert Swinford. Improvements in apparatus for indicating and giving alarm in cases of fire.

483. Lewis James Paine and John Ryan. Improved portable utensils, such as buckets, canteens, baths, and other similar waterproof articles for containing liquids, also applicable for portable life-boats, buoys, or land-marks, and other compressible articles.

489. John Lewis. Improvements in rigging and sparring vessels.

503. James Higgins and Thomas Schofield Whitworth. Improvements in the manufacture of small arms, part of which improvements is also applicable to hardening other articles of metal.

505. William Weild. Improvements in looms or machinery for weaving pile fabrics.

507. John William Sloughgrove and James Henry Wheatley. Improvements in smoke-consuming furnaces.

512. Louis Emile Bataille. Improvements in looms for weaving pile fabrics.

513. Gustav Charles Reitheimer. Improvements in the means of loading or discharging fire-arms.

516. George Hazeldine. Improvements in wheel carriages and in the wheels thereof.

519. John Taylor. An improvement in packing and preserving eggs and other articles of food.

521. John Aitken and Servetus Aitken. Improvements in machines used for preparing, spinning, and doubling cotton, wool, flax, silk, and other fibrous materials.

525. Julian Bernard. Improvements in the manufacture of boots and shoes, or other coverings for the feet, and in the machinery or apparatus to be employed therein.

540. William Mickle. Improvements in the smelting or production of iron from its ore in blast furnaces.

560. Samuel Swingler. An improvement or improvements in the manufacture of certain kinds of metallic spoons, forks, and ladles.

566. Henry Gray. Manufacturing from vegetable substances a material which can be applied to all adhesive surfaces, for either useful or ornamental purposes, as a substitute for, and in the same manner as flock is now used or applied on adhesive surfaces.

568. George Grignon. Certain improvements in the means of launching or detaching boats from ships' sides or davits, and in the apparatus and tackle to be used for that purpose, that the operation may be speedy, spontaneous, and safe.

592. Mark Smith. Improvements in looms for weaving.

629. Isaac Rogers. Improvements in the mode of treating iron ores.

670. Alexander William Williamson. Improvements in stoves or fire-places.

686. William Dray. An improved gear for communicating power from horses or cattle for the purpose of driving machinery. A communication.

692. Joseph Peabody. Improved machinery for obtaining motive power by the action of the wind. A communication.

846. Phillip Levy. An improved wrapper for travelling and personal wear.

900. William Charles Theodore Schaeffer. Improvements in the treatment of the waste wash-waters of wool and other mills.

935. François Joseph Anger. A new metallic alloy. A communication.

1186. Edward Aldridge. Improvements in meters for measuring the flow of liquids and fluids, which can also be employed for obtaining motive power, and in taps for regulating the flow of liquids.

1271. William Henry Graveley. An improved apparatus for cooking purposes, and improvements for the production of fresh water for ship and land use.

1318. Cromwell Fleetwood Varley. Improvements in electric telegraphs.

1359. Joseph Enouy. The means of "removal" of every rotary or "revolving barrel or cylinder" containing chambers, from all revolver pistols, guns, and fire-arms, and the "substitution" in their place by another, and other "barrels or cylinders" in succession.

1376. James Lowe. Improved apparatus to be employed in place of paddle-wheels or ordinary stern-propellers for propelling vessels.

1394. Charles Antoine Hartmann. Certain improvements in the preparation or combination of colours for printing stuffs and textile fabrics.

1419. William Crane Wilkins. An improvement in lamps.

1421. Matthew Shelley. Improvements in cooking utensils.

1428. Luther Young. An improvement in the construction of gas regulators.

1431. William Teall. An improved method of treating and working soapy or greasy waters in order to obtain the greasy substances therefrom.

1455. Thomas Beatt Sharp and Alexander Yorston. Improvements in the arrangement and construction of furnaces or fireplaces.

1467. Thomas Swinburne. Improvements in machinery for applying and obtaining motive power applicable, but not exclusively so, in the propulsion of vessels and railway-trains.

1472. John Raywood. An improved method of stopping railway-trains.

1477. George Lilley. An improvement in water-meters.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed July 3, 1855.

884. Samuel Cunliffe Lister.
946. William Shears.
954. Morris Lyons.
961. Alfred Vincent Newton.
962. William Elliot Carrett.
1066. David Caddick.
1106. Richard Peters.

Sealed July 6, 1855.

62. Bartholomew Predaval.
68. Louis Pierre Lehugeur and Michael Uttinger.
122. David Davidson.
143. Stanislaus Joseph Paris.

148. Peter Armand Lecomte de Fontainemoreau.
172. John Coates.
178. Richard Laming.
200. Joseph Leese, junior.
205. Robert Mallet.
236. George Price.
271. Joseph Gibbons.
335. John Henry Johnson.
480. Charles Iles.
481. Charles Iles.
539. William Smith.
732. Charles Crews and Henry George Gray.
824. Jules Denoual.
868. Alfred Vincent Newton.
870. William Jones.
907. Alfred Vincent Newton.
908. William Gossage.
917. Charles Piazzi Smyth.
979. William Banks, Henry Hampson, and John Banks.
1009. Robert Broadbent, Squire Farron, and Benjamin Grundy.
1014. Ebenezer Tyzack.

Sealed July 10, 1855.

63. William Thomas Henley.
93. William Henry Nevill.
98. Edward Lambert Hayward.
106. George Riley.
107. Edward Haynes, junior.
424. William Armand Gilbee.
1041. John Mayo Worrall.
1042. John Mayo Worrall.
1047. Cullen Whipple.
1048. Samuel Grainicher.
1057. John Harris and Thomas Summerson.
1062. John Henry Johnson.
1072. William Bridges Adams.
1090. Alexander Robertson.
1092. Alfred Charles Garratt.
1095. George Tomlinson Bousfield.
1150. Alfred Vincent Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

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Mechanics' Magazine.

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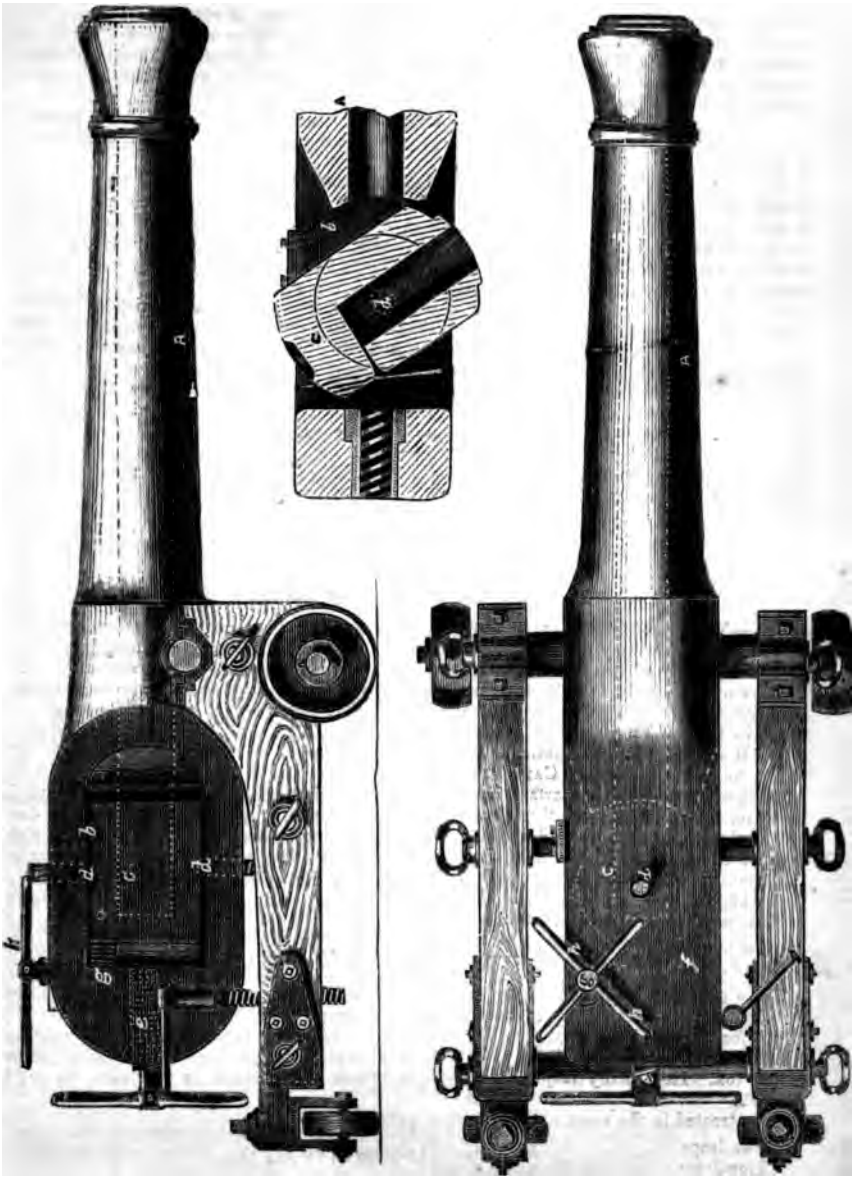
Edited by R. A. Brooman, 166, Fleet-street.

MAUDSLAY'S PATENT BREECH-LOADING CANNON.

Fig. 1. Fig. 3. Fig. 2.



MAUDSLAY'S PATENT BREECH-LOADING CANNON.

(Patent dated December 2, 1854.)

THE engravings on the preceding page represent a cannon patented at the above date by Mr. J. Maudslay, of Westminster-road. This cannon is so made at the breech end as to allow of an oblong aperture being made through the side, sufficiently large to receive a breech piece or charge chamber, which rests on two pivots, so placed as to keep it in balance, and to enable the charge chamber to be easily moved round sideways by a rack and pinion, or other suitable means, in order that the open end of the chamber may receive the powder and shot, and be then turned to its position for firing, where the bore of the charge chamber is in a right line with the bore in the body of the gun. This chamber is also moved forward into close contact with the body of the gun, in order to prevent escape and consequent loss of effect in the discharge, by means of a powerful screw or wedge.

Fig. 1 is a side elevation of a piece of ordnance constructed on the above principle, the breech end having a horizontal opening through it to receive the breech piece, which is open at one end and closed at the other, and which may be made of different metal to that of which the gun itself is constructed, wrought iron being preferred; and, if desirable may be so constructed that the open end to receive the charge may turn upwards instead of sideways as above described. Fig. 2 is a plan, and fig. 3 shows a horizontal section, of a portion of the breech end of the gun. A is the gun, formed with an enlarged and strong breech, with an opening, *b*, through it, to receive the breech piece, C, which turns on the points, *d*, *d*, there being a slight play in these points of bearing to admit of the breech piece, C, being set up tightly by the screw, *e*, against the end of the barrel of the gun, A, there being a recess formed in the back end of the breech piece, C, to receive the end of the screw, *e*, and to secure it in the right position to be discharged. The breech piece is formed with a toothed rack, *f*, into which the pinion on the axis, *g*, takes. *h* is a handle, fixed on the axis, *g*, by turning which the breech piece, C, is moved into and out from the opening; when it has been moved out, it will be in a position to receive a cartridge, and a ball or other projectile.

THE ABUSE OF ALGEBRA.

To the Editor of the Mechanics' Magazine.

SIR,—The last of forty equations in "Cassell's Algebra," a recent adaptation by "Professor Wallace" of an American work, appears to me to be ill-placed; if the object be to give the young student examples that cannot be more easily worked by common arithmetic.

If we may judge by the algebraic means employed for the solution of a similar question on page 42, the authors could not have known that this class of questions—sometimes found in Rule of Three collections—may be referred to a general principle which supplies one of the simplest of arithmetical rules for their "answers."

The following is that of "Cassell's Algebra":

"From the first of two mortars in a battery 36 shells are thrown before the second is ready for firing. Shells are then thrown from both in the proportion of 8 from the first to 7 of the second; the second mortar requiring as much powder for 3 charges as the first does for 4. It is required to determine after how many discharges of the second mortar the quantity of powder consumed by it is equal to the quantity consumed by the first? Ans. 189."

This may be readily worked thus:

1st mortar
2nd ditto $\frac{8}{7} - \frac{4}{3} = \frac{4}{21} \therefore \frac{21}{4} \times 36 = 189$ discharges.

The algebraical mode of working such a question is shown at page 42 by means of the well-known hare-leap example; here varied to fox-leap:

"A fox pursued by a greyhound is 60 of his own leaps in advance of the dog. He makes 9 leaps, while the greyhound makes but 6; but 3 leaps of the greyhound are equal to 7 leaps of the fox. How many leaps must the greyhound make before he overtakes the fox? Ans. 72."

This, treated in the same way as the first question, is—

Fox-leaps
Dog-leaps $\frac{7}{3} - \frac{9}{6} = \frac{5}{6} \therefore \frac{6}{5} \times 60 = 72$ dog-leaps.

The chief portion of the algebraical model is—

[redacted]

$$\frac{7x}{3} = 60 + \frac{3x}{2} \therefore 14x = 360 + 9x \therefore 5x = 360\, x \therefore x = 72;$$

a clumsy mode of operating in comparison with the concise arithmetical process.

In questions of this kind we have usually two bodies of different velocities, in motion (two trains, animals, &c.), the slower of which is in advance of the other a certain number of miles, yards, fox-leaps, &c. (the *positive excess*); and it is obvious that the quicker body will gain a part of the intervening distance (= to the *positive difference*) every hour, every discharge or leap, &c. In the first example it is every discharge, in the second every leap. The second mortar gains $\frac{4}{21}$ of a first mortar-charge at every discharge, and the greyhound gains $\frac{5}{6}$ of a fox-leap at every dog-leap.

The rule then is—*Divide the positive excess by the positive difference.*

The positive difference, it will be observed, is always equivalent to a unit of the answer.

In the first question the ratio is $\overset{\text{1st M.}}{8} : \overset{\text{2nd M.}}{7} = 1\frac{1}{7} : 1$; that is, $\frac{1}{7}$ of a charge gained by the first mortar at every *single* discharge of the second. But the second requires as much powder for 3 charges as the first for 4.

$$\therefore \overset{\text{1st M.}}{4} : \overset{\text{2nd M.}}{3} = 1\frac{1}{3} : 1.$$

The first mortar, therefore, also loses $\frac{1}{3}$ of a charge at every single discharge of the second. $\frac{1}{3} - \frac{1}{7} = \frac{4}{21}$ of a charge the loss of the first mortar, and therefore the gain of the second at every single discharge of the second. $\frac{4}{21}$, then, being the positive difference, and 36 the excess $\frac{36}{\frac{4}{21}} = \frac{21}{4} \times 36 = 189$.

We have, however, another instance of the abuse of algebra, much more curious, in Part 1st, page 35, of the treatise published in "Chambers' Educational Course;" and a similar mode of proving the same obvious truth (obvious when exactly described), may be found in many treatises, algebraic and arithmetical.

"If the divisor and dividend be both multiplied, or both divided by the same quantity, the quotient will be unaltered.

"For if N = the dividend, and D = the divisor, and if m, n, and d, be such quantities that $N = m\,n$, and $D = m\,d$, then $\frac{N}{D} = \frac{n}{d}$. For if $\frac{n}{d} = q$, then if n be multiplied by 2, the quotient will evidently be $2\,q$; but if n be doubled, d be also doubled, then $2\,n \div 2\,d$ will just give the same quotient q; so $3\,n \div 3\,d$ will give the quotient q; and, generally, $m\,n \div m\,d$ will give for the quotient the same value q, that is, $\frac{m\,n}{m\,d} = q$, or $\frac{N}{D} = q$. Hence $\frac{N}{D} = \frac{n}{d}$, that is, if $\frac{n}{d} = q$, then $\frac{m\,n}{m\,d}$ or $\frac{N}{D} = q$. And if $\frac{N}{D} = q$, then $\frac{n}{d}$ is also $= q$, where $n = \frac{N}{m}$ and $d = \frac{D}{m}$."

All this was written to prove that $6 \times 1 = 1$, and $\frac{5}{1} = 5$! For, if both terms or components of $\frac{24}{4}$ be "multiplied" or "divided" by 4 ($= \frac{24}{4} \times \frac{4}{4} = \frac{24}{4} \times 1 = 6 \times 1 = 6$), the operation, so described, is nothing more than another form of $\frac{24}{4} \times 1$, that is, 6×1.

A finer example than the algebraical proof of making plain things obscure could not easily be discovered. Even Euclid, however, supplies us with a similar one, as I have shown elsewhere ("Exact Philosophy," Book 2nd). The facts in all such cases are first obscured by misdescription, and then a demonstration becomes necessary to clear up the gratuitous obscuration. Why dislocate the components of the forms $\frac{24}{4}$ and $\frac{4}{4}$, and so obscure their character? Why not say at once, that to "multiply" $\frac{24}{4}$ by $\frac{4}{4}$ is to multiply $\frac{24}{4}$ or 6 by 1? or, generally, $\frac{a}{b} \times \frac{c}{c} = \frac{a}{b}$?

The use of such terms as "multiply" and "divide," tends also to generate inexact ideas of the operations. To multiply both components of the form $\frac{24}{4}$ by 4, means, to take $\frac{24}{4}$, $\frac{4}{\text{quarters}}$ of a time, that is *once*; 1×6. To divide the same by the same, means to take

from 6, $\frac{4}{\text{quarters}}$ of a unit as often as it contains $\frac{4}{\text{quarters}}$ of a unit; that is, 6×1; or $\frac{24}{4}$ contains $\frac{4}{\text{quarters}}$ of a unit, that is 1, 6 times.

All such clumsy modes of proving the simple truth, that the value of a fraction is not altered by "multiplying" it by a unit in the form of a fraction,—arise from a recognition of the divisor as something apart from the dividend, and *vice versâ*. They are, however, exactly coindicators of one quantity; components of one of many forms of a particular value sometimes called quotient.

I am, Sir, yours, &c.,

HUGHES FRASER HALLE, LL.D.

ON WORKING STEAM EXPANSIVELY IN MARINE ENGINES.

BY MR. E. A. ALLEN, OF LONDON.*

It is proposed in the present paper to consider the practical or commercial advantages of working steam expansively in the marine engine, as distinguished from the theoretical advantages, which latter are better understood and more generally admitted.

It has been established theoretically, that considerable economy is obtainable by working steam expansively. Thus—if steam be allowed to occupy or expand into twice the space it originally occupied, the power developed would be as 1·7 to 1, and according to the following Table:—

Spaces occupied by Steam	1	2	3	4	5	6	7	8	9	10
Power developed....	1	1·7	2·1	2·4	2·6	2·8	3·0	3·1	3·2	3·3

The same volume of steam being used in all cases, and allowed to occupy the increased spaces during expansion.

Notwithstanding that this has been long known, it has only been comparatively recently that practical benefit has been derived to any considerable extent from working steam expansively, and even at the present day the principle is but imperfectly recognised, or at least is very inadequately carried out in practice.

The attention of the Institution has been called on several occasions to the advantages of working steam expansively, both in engines employed in manufactories and in mining works and also in locomotives; and the papers of Mr. Fairbairn, Mr. Samuel, and Mr. Clark, have taken up the subject in reference to those particular cases.

The object of the present paper is confined to the advantages of working steam expansively in *marine engines*, and to endeavour to arrive at the causes which have hitherto prevented the principle from being as successfully carried out and as productive of economy as in the case of pumping or other stationary engines.

It would almost seem that the apparent necessity of making the engines of steam vessels occupy the least possible space, actually prevented, for a very long time, any attempt whatever being made to economize fuel; everything being overlooked or considered unimportant when compared to the supposed advantage of having the engine space as small as possible.

It was very natural that the first step in the economizing of fuel, by working steam expansively, should be taken in places where the spaces which the engines occupied could be almost indefinitely increased; and we find, consequently, that the system of working expansively made very great progress, and may almost be said to have been perfected in pumping and winding engines, before its value was at all recognized in other cases. Pumping engines had been worked on the expansive principle for some time, before any attempt was made to carry it out in engines employed in the manufacturing districts; this being chiefly owing to the cheapness of coal and the consequent disregard of economy, and also to the circumstance of a more uniform motion being required.

It will be seen that in the case of engines of manufactories, the ground space was but little more limited than in the case of pumping engines, and probably quite as little limited in respect to vertical height. The boiler-room in these cases was also almost unlimited, as also was the weight of the machinery, and it was not until the principle of expansion was considered with reference

* The substance of a paper read at the last Meeting of the Institution of Mechanical Engineers, Birmingham.

[redacted]

to marine engines and locomotives, that the objections to increased bulk and weight of the machinery became, or appeared to become, so important, as to prevent its being carried into practice.

One very important matter appears to have been overlooked in considering the weight of the marine engine, and that is, that it is not simply the weight of the machinery that has to be considered, but the joint weight of the machinery and fuel. It is true that in the case of the first steamboats the weight of the fuel carried did not form so important an item as at the present time; yet, as compared to that of the engine and boiler, it was, and always must be, considerable in every steam vessel. In river boats it may be taken roughly at about one quarter the entire weight of engines, boilers, and water, equal to about 2½ days' consumption, this being the least proportion.

The following Table gives the weight of coals usually taken by steamers, according to the length of voyage, &c.:

TABLE I.

Proportion of Weight of Coals to Weight of Machinery.

Class.	Service.	Station or Employment.	Number of Days' Consumption.	Proportion of Weight of Coals to Weight of Machinery.
1	River	Thames and Clyde	2½	¼th.
2	Coasting and Continental	General Steam Navigation Company, Colliers, &c.	10	Equal.
3	Ocean, Short voyages	America and Government..	15	1½ times.
4	Ocean, Long voyages	Australia	40*	4 times.
5	Ocean, proposed voyage out and home	India, &c.	70	7 times.

It will thus be seen that, except in river steamers, any saving in the quantity of fuel must be of vital importance, and the more so in proportion to the length of voyage.

In the large steamer now constructing for the Eastern Steam Navigation Company, the quantity of coals taken is proposed to be seven times the gross weight of machinery, so that any small per-centage of saving would really amount to a considerable quantity.

On one occasion the *Crœsus* took nearly 1,400 tons of coals, being about in the proportion of 7 to 1 to weight of machinery. This quantity was intended to work her outward and part of her homeward voyage.

It will be found that, as a general rule, marine engines are only using their steam expansively to a very small extent, the steam usually being cut off at 3·4ths of the stroke, thus economising in the ratio of 1·3 to 1 only, or say practically equal to a saving of 20 per cent. on the coal consumed, if no expansion were allowed to take place.

This amount of expansion is given by the slide alone having sufficient lap on the steam side. It is now usual, however, to fit expansion valves to the Government engines, as well as to many in the merchant service, for the purpose of working expansively when short of coal, or when the vessels are running with a fair wind; but these appliances are never designed for continual working. The "link motion" is also used in marine engines for occasional expansive working.

From a pamphlet recently published by Captain J. C. Hoseason, lately commanding the *Inflexible*, it appears that so far back as 1842, the attention of the Admiralty was called to the subject now in hand, viz., the economy of expanding steam. But at that time the principal difficulty in using steam expansively was doubtless the low pressure at which the boilers were worked, being only about 5 lbs. per square inch.

It appears, however, that in 1842 the pressure in the boilers of the *Inflexible* was raised from 6 to 8 lbs., by Captain Hoseason's desire, and the pressure in the *Terrible* was fixed at 10 lbs.

In 1849, the Indian Government obtained a paper on the expansive action of steam from Messrs. Maudslay, Sons, and Field; and from the extracts given in Captain Hoseason's pamphlet, it would appear that the case was fairly made out.

To prove the extent to which the *weight of the machinery* could be increased without increasing the *gross weight* carried, the following example is given:

"Suppose a vessel with 400 horse-power

* Steamers taking coal equal to only four times the weight of machinery, are obliged to coal on the way out and home.

engines working up to their full power; the consumption would be 30 tons per day, and she would carry 750 tons of coal, which would be 25 days' consumption.

The 400 horse engines would weigh	300 tons.
Coal..	750 „
Total weight..	1,050 „

"Suppose the same vessel with 600 horse engines, but only working up to 400 horse-power, the consumption would then be 22½ tons per day, and she would carry 600 tons of coal, which is 26⅔ days' consumption.

The 600 horse engines would weigh	450 tons.
Coal..	600 „
Total weight..	1,050 „

"Thus, with the larger engines, the vessel will carry 1⅔ days' more coal than with the smaller engines, and would save during 25 days the value of 150 tons of coal."

These facts having been pointed out so forcibly six years ago, it appears strange that the principles upon which they were founded should not have been carried out more fully than they have been. Comparatively, however, nothing has been done, although with respect to the Australian vessels, the necessity of economising has increased threefold, from the quantity of coal required to be carried being just about three times that taken by the Government vessels, viz., about 4 times the weight of machinery, instead of 1⅓ times. It will be seen that as the necessity for economy increases, so does the facility or means of producing it increase, from the great proportionate weight of coal upon which a reduction can be made, in order to compensate for any increase in the weight of machinery.

In such cases as the Australian vessels, where the weight of coals carried amounts to 4 times the weight of machinery, a saving of 25 per cent. of the coals would allow of the weight of the machinery being doubled, without the gross weight being increased.

Take, for example, engines of 400 horse-power, weighing 300 tons, and the coals carried 1,200 tons, making a total of 1,500 tons. If the coals by more economical working can be reduced to 900 tons, then the engines may be allowed to weigh 600 tons, and the gross weight to be carried will only be the same, the coal saved being equal to 300 tons. Extending Messrs. Maudslay's example, it will be seen by the following Table II., to what extent the weight of the machinery could be increased without adding to the gross weight, in the case of the coals carried being equal to 4 times the weight of machinery, the power worked up to being the same.

TABLE II.

Showing the increased weight of Machinery caused by increasing the nominal horse-power or size of the engines, and also the necessary reduction in the quantity of coals taken, so that the gross weight may remain the same.

Power Worked to.	Nominal Horse-power.	Weight of Machinery.	Weight of Coals.	Total weight carried.	Consumption per day.	Number of days' Consumption.
H.P.	H.P.	Tons.	Tons.	Tons.	Tons.	Days.
Full.	400	300	1200	1500	30	40
400	600	450	1050	1500	22½	46
400	800	600	900	1500	20	45
400	1000	750	750	1500	19	40
400	1200	900	600	1500	18	35

From this it seems that an increase in the weight of machinery to 2½ times, still admits of coals sufficient to work for as many days, and saves 450 tons of coal.

The object of the present paper is somewhat different from that aimed at in the pamphlet referred to, although nearly the same considerations are involved. It was then desired to show that both the power and weight of the engines could be increased without increasing the gross weights carried, the increased power being only occasionally used—this being a most important point for war steamers, and others, when working against the hurricanes in the Indian seas, &c. This advisable increase of power, however, involves a corresponding increase in the first cost of engines, though attended with counterbalancing advantages.

It is proposed now to show how the *engines alone may be increased* in size for expansive working, and consequently slightly increased in weight, not only without increasing the gross weight carried, but how it can be done so as very materially to *lessen the gross weights* carried, that is, in coal and machinery, leaving greater stowage for cargo.

[redacted]

It is presumed that the power placed in vessels is now sufficient (whether it is so or not does not affect the present question), and therefore in the examples given no provision is made for the engine power being even temporarily increased, although this would probably, in many cases, be a great desideratum. Neither are the boilers supposed to be increased, either in number or size; but, to avoid complicating the deductions, they are supposed to remain the same, especially since at present marine boilers are too much overworked to last any length of time, and an increase of boiler room relative to the power would be desirable. Strictly considered, however, the weight of the boilers would be diminished in about the proportion of the diminution of coal consumed.

Taking the five classes of steamers given in the preceding Table I., which shows the weight of coals usually taken in the several cases, it will now be necessary to give the spaces occupied by them in proportion to that occupied by the engines, exclusive of the boilers and passages. The following Table III., shows the floor or horizontal space occupied by the coal-bunkers in the five classes of steamers.

The engines, boilers, and water are supposed at 13 cwt. per horse-power.

The space occupied by coals is taken at 45 cubic feet per ton.

The floor space occupied by engines alone is taken at ¾ square foot per horse-power.

TABLE III.

Proportion of space occupied by Coals to that occupied by Engines alone.

Class.	Station of Service.	Weight of Coals, in terms of weight of Machinery.	Depth of Coals in each Class of Vessel, approximate.	Horizontal or floor space occupied by Coals, in proportion to Engines alone.
1	River	1-4th.	9 feet.	Equal.
2	Coasting and Continental ..	Equal.	12 feet.	3 times.
3	Ocean Short Voyages, and Government	1½ times.	20 feet.	3 times.
4	Ocean Long Voyages	4 times.	25 feet.	5 times.
5	Ocean Proposed Voyage out and Home	7 times.	50 feet.	5 times.

It will be seen from the above Table, that in the case of Government vessels, where the weight of coals is usually equal to 1½ times the gross weight of machinery, the horizontal space occupied by the coal may be taken at 3 times the space taken up by the engines themselves (that is, exclusive of boilers and passages), or about equal to the total machinery space, if the boilers and passages be included.

In the example quoted above from Messrs. Maudslay, where the coal weighed 2¼ times the machinery, instead of 1½ times, which is the quantity more generally taken, the horizontal or floor *space* occupied would be 5 times that occupied by the engines alone, instead of 3 times as given above. So that supposing the passages left the same, the 400 horse-power engines could be replaced by engines of 600 horse-power, and the saving of space required for coal would balance the increased space occupied by the engines, consequently leaving the total weights carried the same, and the total space occupied by machinery and coal (taken together) the same, with the 660 horse-power engines, as with the 400 horse-power.

[The author here gives another Table for the purpose of showing the relative weights of the different parts of the machinery in steam vessels, taken from two tenders supplied to the Government for paddle-wheel engines of 260 horse-power, and screw engines of 450 horse-power; showing also the average of 18 estimates sent to Government by different engine-makers, giving the separate weights of the various parts of the machinery (as the engines, boilers, water, wheels or screws, &c.) and from it draws the conclusion that it will be sufficiently near for his present purpose to consider the relative weights of the different parts of marine engines to be as follows,] viz. :—

	Per nominal horse-power.
Engines	5½ cwt.
Boilers and fitting . .	3 cwt.
Water	2 cwt.
Wheels or screw . . .	1 cwt.
Spare gear	¾ cwt.
Coal-bunkers (containing about 15 cwt. per horse-power)	¾ cwt.
Total	13 cwt.

The practical applications which are made of these particulars in the calculations contained in this paper are, first, that the weight of marine machinery may be fairly assumed at 13 cwt. per nominal horse-power; and secondly, that the weight of the engines and spare gear together may be taken at *one half* of the gross weight of machinery. This consideration is of much importance, as it is the engines alone that are supposed to be increased in size and weight, to admit of greater expansion of the steam; the boilers and wheels or screw being supposed to remain the same, as has been before stated.

(*To be continued.*)

HANCOCK'S CAOUTCHOUC PATENT: LAW CASE.

Court of Queen's Bench, Guildhall, July 7th—9th.

Sittings at Nisi Prius, before Lord Campbell and a Special Jury.

THE QUEEN V. HANCOCK AND OTHERS.

The Attorney-General, Mr. H. Hill, Q.C., Mr. Hindmarch, and Mr. Macrory, appeared for the plaintiff; and Sir F. Thesiger, Mr. Serjeant Channel, Mr. Grove, Q.C., Mr. Webster, and Mr. Karslake, for the defendant.

The pleadings having been opened, Sir F. Thesiger, for the defendant, said, this was a proceeding by *scire facias* to repeal a patent, which, in the month of November, 1843, had been granted to Thomas Hancock, for certain improvements in the manufacture of caoutchouc, or India rubber. One alleged ground for the repeal of the patent was, that at the date of the patent the patentee was not in possession of the invention—an allegation which was denied by the defendant. According to the old practice, it was usual for the prosecutor who sought to impeach the patent to begin, but on the present occasion, in accordance with the provisions of the recent Patent Law Amendment Act, the defendant had the right to begin and first give evidence to maintain his right to the patent which he had obtained. It appeared that Mr. Hancock's patent had been granted on the 21st of November, 1843, for improvements in the preparation and manufacture of caoutchouc, and combining with other substances, whereby leather and other materials were rendered waterproof, and the caoutchouc rendered less liable to stiffen upon exposures to cold. The patent would expire at the end of two years from next November. Mr. Hancock had been engaged for about thirty years in the manufacture of caoutchouc, and prior to the year 1843 he had taken out as many as nine patents for improvements in its manufacture. There were three things which interfered with the useful application of caoutchouc—its clammy adhesiveness, its liability to change from variety of temperature, becoming hardened by cold and relaxed by heat—and its being affected by oil or grease. To get rid of these defects had been the great object of Mr. Hancock's efforts. It would appear that in the year 1842, a Mr. Moulton, an Englishman resident in America, came over to this country, bringing with him certain specimens of caoutchouc from Mr. Goodyear, of New York. These specimens possessed the property termed "cold resistance," or, in more intelligible language, they were not liable to be affected either by heat or cold. Mr. Moulton exhibited these specimens to several persons, and among the rest, to Messrs. Macintosh and Co., of Manchester, in which firm Mr. Hancock is a partner, and on being asked what Mr. Goodyear would sell his secret for, said that Mr. Goodyear expected to see his way to realize £50,000 by his invention. The Messrs. Macintosh advised Mr. Moulton that the inventor ought to take out a patent, but this was not done at the time, and Mr. Moulton returned to America, leaving behind him several specimens of the manufacture, one or two of which were put into the hands of Mr. Hancock by his partner. These specimens merely showed the result, and it was not possible by any analysis to find out the mode by which the change had been effected. It was discovered that the caoutchouc was compounded with sulphur and white lead, but sulphur had been compounded with caoutchouc before without the result being obtained. It was only by a long course of laborious experiments that the discovery had been made by Mr. Hancock, which he patented in the month of November, 1843. His invention consisted in blending caoutchouc with sulphur at a certain heat, whereby the caoutchouc acquired the property termed "cold resistance." At that time it was usual to deposit with the Solicitor-General what was termed a "deposit paper," containing a suggestion of the general nature of the invention, and it was now contended, from the terms of Mr. Hancock's "deposit paper," that he could not at that time have been acquainted with the secret. The grant of the patent was opposed, but not by Mr. Goodyear; and six months afterwards—viz., in November, 1843—the specification was enrolled, containing the full description of the invention. Within two months afterwards—viz., in January, 1844—Mr. Goodyear also took out his patent. For several years no complaint was made, but it was

now sought to set aside Mr. Hancock's patent, upon the ground that he was not the real inventor, but had learnt the art which he had patented by an examination of Mr. Goodyear's specimens; Mr. Hancock contending that his discovery was the result of experiments which he had carried on for many years.

Mr. HANCOCK was examined by Serjeant Channel, in support of his case, and cross-examined by the Attorney-General at great length in the course of which he produced some specimens of caoutchouc combined with sulphur, spread upon paper and cloth, and subjected to the action of heat, and on which he had been experimenting in the months of June and August, 1843, and which he contended showed that vulcanization had been effected. He admitted that he saw Goodyear's specimens before he made those experiments, and that they suggested the experiments which led to the discovery which he made of the process.

Professors GRAHAM, BRANDE, and CAMPBELL, and Dr. A. S. TAYLOR, were also examined.

Mr. H. HILL addressed the jury for the prosecutor, and contended that Mr. Hancock, at the time he obtained his patent, was not acquainted with vulcanization, but had discovered it by having examined the specimens of India rubber which had been manufactured in America, by Mr. Goodyear, and brought to this country, in 1842, by Mr. Moulton. The "deposit paper," lodged with the Solicitor-General by Mr. Hancock, when he applied for his patent, showed that he was then ignorant of the invention, and it was clear that he had discovered the secret by experimenting upon Mr. Goodyear's specimens, one or two of which he obtained from his partner, with whom they had been left by Mr. Moulton, when he visited England in 1842.

Mr. GOODYEAR, Mr. MOULTON, Mr. FOSTER, and some other witnesses, were then examined for the prosecution.

Lord CAMPBELL summed up the evidence to the jury, and said, that if Goodyear's invention was prior in point of time, it was not handsome in Hancock to look at his specimens and to try and find out his discovery; and if Goodyear was the inventor, it was to be regretted that he should not have the benefit of the invention. The question, however, was, whether before his patent Hancock was the inventor of this process, for if he was, the objection failed, and the defendant was entitled to a verdict. But if he did not know it then, but by a subsequent discovery was enabled to insert it in his specification, he was not entitled to the patent, and the jury ought to find their verdict for the prosecutors.

The jury considered their verdict for a few minutes, and then found for the defendant.

Lord CAMPBELL gave the prosecutors leave to move the Court to enter the verdict in their favour upon a point respecting the patentee's claim to the use of asphalte in combination, which has been mentioned in the course of the trial, and it was contended that that part of the invention was not new, being comprised in a previous patent granted to a person of the name of Fanshawe.

PULS' PATENT GALVANIC BATTERY.

THE following engravings represent a galvanic battery patented recently by Mr. F. Puls, philosophical instrument-maker, of the Whitechapel-road, a description of which was promised on page 16 of our current volume (No. 1665). Fig. 1 is a horizontal section of the battery, and fig. 2, a transverse vertical section. A A is a box or case of gutta percha or other suitable material; B B are projections therein, for the purpose of retaining the plates in a vertical position; C C partitions or stays of wood, gutta percha, or other suitable material, for the purpose of keeping the plates apart;

Fig. 1.

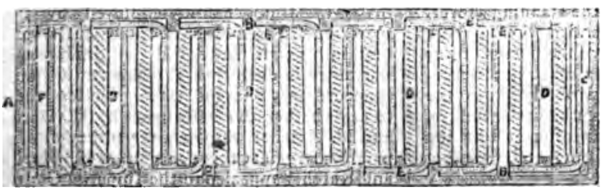
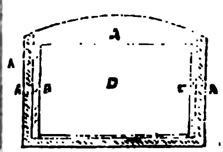


Fig. 2.



D D plates of the battery, positive and negative alternately; E E lateral prolongations of the plates, by which they are rigidly connected in pairs; F and G end plates, or positive or negative poles, to which the electrodes, or apparatus that the battery is

to be connected with, are to be affixed, through the medium of screws, solder, a small cup of quicksilver, or otherwise. The battery is to be a single fluid battery with one cell, in which three or more pairs of plates can be inserted according to the purposes for which it is to be employed.

M'CORMICK'S REAPING MACHINE.

We find from the French papers, that this machine is at present exciting considerable attention among the agriculturists of France. The *Echo Agricole* of the 15th says: "M'Cormick's American reaper has just obtained complete success (at the Imperial School of Agriculture at Grignon). It was employed for reaping a crop of clover, which, in this particular instance, was a troublesome operation, owing to the fineness of the grass, and to the crop having been beaten down by the late rains. The reaper was, however, completely successful, even in the parts in which the crop had been laid. Numerous agriculturists, who were present at the trial, declared that the common scythe would not have cut as well and as regularly as this machine, and remarked that it cut better in the strong than in the feeble parts of the crop. The reaper worked at the rate of about 18 or 19 acres daily, with one man and two horses."

Another writer in the Paris paper, the *American*, speaking of the same trial says, "I never had seen it myself, although I heard of M'Cormick's reaper many years since, and I must say it has given me great pleasure to have witnessed this interesting trial.

"The horses started at a brisk pace, and the cutter went into the clover like a warm knife into butter. The reel turned the cut clover beautifully over, and laid it in an even swath behind the machine as fast as the horses could walk. When they turned the swath from the stubble and saw how even and close it was cut to the ground, an involuntary hurrah burst forth from all the witnesses. The machine went on, followed by the whole crowd, round the field, and it cut the laying as well as the standing clover, to the astonishment and satisfaction of every one. The man who drove the horses, never before saw such a curious machine; nevertheless he worked it perfectly from the start. I am not of an enthusiastic nature, but I must confess I ran after it like the rest, wondering all the time at its perfect operation.

"It was curious to see the old French farmers running and jumping after the mower, turning now and then the cut clover, examining the stubble, gesticulating and exclaiming all the while 'Merveilleux! parfait! magnifique!' and applauding this ingenious contrivance, as they would have done one of their favourite play actors. The director explained very clearly the advantages of this unique invention, praised its great simplicity, and declared himself fully convinced of its great practical utility and superiority over all other similar machines existing.

"In fact, there cannot be enough said about it; it is a most complete implement. We have little to show in this great Exhibition, but M'Cormick's Mowing and Reaping Machine alone will again establish the American character as an inventive and ingenious people, and every American may be proud of the efforts of his countryman, who has rendered such important services to agriculture, the main pillar of civilization."

MINIÉ'S RIFLE BALL.

The patent obtained in France by M. Minié in 1849 for his *à culot* ball has just been declared void by the Imperial Court. The following account of the transactions which have led to this result is given in the *Intelligencer* for July 21. Some time back a gentleman of Montpellier, named Marès, who has occupied himself a good deal with fire-arms, was charged by the Government to make experiments with balls, and he after a while produced one similar to that of M. Minié, and sold them as his own. M. Manceaux, to whom M. Minié's patent had been ceded, considered this a violation of the patent of 1849, and he caused the balls M. Marès had made to be seized, and instituted a prosecution of that gentleman before the Tribunal of Correctional Police for having pirated his balls; he also prosecuted a manufacturer named Katcher, who had cast the balls for him. When the case came to be heard, M. Marès contended that the patent of M. Minié was absolutely null and void, inasmuch as he had not invented the ball on his own account, but as the employé of the Government, and that it was consequently to the Government that it belonged. The Tribunal, though expressing surprise that M. Minié, being employed by the Government, should have taken out a patent in his own name, did not think itself warranted in declaring the patent null, and it accordingly charged three practical men to see whether the balls made by M. Marès and M. Katcher were or not a piracy of the patent. Against this decision MM. Marès and Katcher appealed to the Imperial Court, and the case was heard yesterday. M. Marès, after stating that his experiments had been made for the Government without any remuneration, and that therefore, if any

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piracy had been committed, it was not he who was responsible, but the Government, proceeded to contend that M. Minié had been guilty of a breach of faith in taking out a patent for the ball in question, inasmuch as he had been specially employed by the Government for years at Vincennes to seek and effect improvements in fire-arms, and had had his services recompensed not only by a liberal salary, but by the grade of commandant, by decorations, and by presents of money. He therefore contended that the ball was the property not of Minié but of the Government, and that the patent of that officer must be declared void. M. Manceaux, on his part, contended that Commandant Minié, notwithstanding he was in the service of the State, was justified in taking out the patent in his own name. The Court decided that M. Minié must be considered as having invented the ball for the Government, and not for himself, and that consequently his patent was void. Being void, it said that Manceaux could not prosecute for money of it, and it therefore declared his complaint against Marès and Katcher unfounded, and annulled the seizure of the balls which they had made. It further decided that he had done injury to M. Marès and M. Katcher by his prosecution of them, and that by way of redress he should pay the former 200 fr., and the latter 100 fr. damages; and, moreover, it condemned him to pay all the costs.

LIEUT.-COLONEL PARLBY ON THE FLIGHT OF PROJECTILES.

To the Editor of the Mechanics' Magazine.

Sir,—In pursuing an inquiry into the circumstances attending the flight of projectiles, we must direct our attention to the following points:

1. The nature and the resistance of the air or medium through which the projectile moves.
2. The shape, velocity, and momentum of the projectile.
3. The circumstances attending the inflammation of gunpowder on the projectile power.

Air is a medium highly elastic, and pressing uniformly at the level of the ocean with the force of about 15 lbs. on the square inch of surface. From experiment it has been found that air, under this equal natural pressure of 15 lbs. on the square inch, will rush into a vacuum with a velocity of from 1,200 to 1,400 feet in a second of time, and hence all writers on the subject of projectiles have imagined that when a solid is moving through the atmosphere with a greater velocity than 1,400 feet in a second, a vacuum will be produced in the rear of the solid as it passes forward.

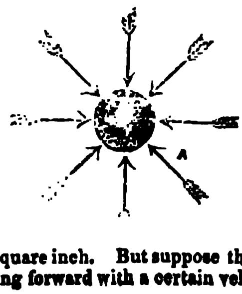
It may seem presumptuous to question this opinion or theory so generally asserted by such celebrated men as Benjamin Robins, Hutton, and the respected authority of Sir Howard Douglas, in the present day; but this is one of the noble uses for which reason is given us, viz., to examine and question narrowly every theory, however strongly supported, before we assent: if we do not this, we allow our reason to be used as a puppet, and to be pulled by the strings of any great name or authority.

I firmly believe that to suppose that there is a vacuum left behind any solid projectile, with any velocity that we can give it, is a great mistake; for we know by almost daily observation that, whenever there is a vacuum produced in the air, sound more or less violent is produced by the particles of the air collapsing upon each other. This is proved by the sound of the boys' pop-gun, in the common philosophical experiment of the breaking of the bladder over the mouth of a vessel exhausted of air by the air-pump, by the thunder-clap, by the violent detonation of many powerful chemical mixtures which are known to produce a vacuum on inflammation; and thus, if there were a vacuum left behind the projectile in its flight, it would be accompanied during the whole of its passage through the air with a noise resembling thunder as long as its velocity continued to exceed 1,400 feet in a second.

As it is very important that this error, if it is one, as I humbly presume, should be corrected in our books and schools, let me now set before the reader some simple facts explaining the circumstances attending the flight of a solid projectile.

First, let us suppose the solid—as a cannon-ball—stationary. It is evident that, as long as the ball remains in this stationary state, the atmosphere will press equally upon every part of the surface, as indicated at A, in fig. 1, with the uniform pressure of 15 lbs.

Fig. 1.



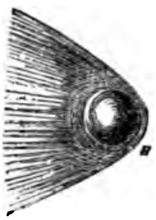
on the square inch. But suppose the ball to be moving forward with a certain velocity of,

say 700 feet in a second, or half the velocity with which air is supposed to rush into a vacuum, it is evident then that we must consider the air as a resisting medium in front of the ball, and an assisting medium in its rear; for as the ball moves along, it will compress the air in front to half its natural volume, and thus the power of 15 lbs. must be exerted to displace the volume of air of which it assumes the place, 7½ lbs. will be exerted to compress the air in front to half its density, and thus 7½ lbs. must be sustained to keep up the compression against the elasticity of the air in its endeavour to re-expand itself as the ball moves along. Then we have the assisting power of 7½ lbs. in the rear of the ball, that being the equivalent to half the velocity with which the air will rush into a vacuum.

Here we have supposed the column of air to be confined in a tube into which the ball fits like a piston, leaving out of calculation all the consequences of friction as it moves along. But how different is the circumstance attending the flight of a shot through the unconfined highly elastic atmosphere!

The circumstance attending the ball in its flight may be represented to our senses by B in fig. 2. Let us suppose B to be the

Fig. 2.



ball moving through the air with great velocity, and of course causing violent compression as it passes to the particles of air which are in front, as in some degree represented by the fine lines. Is it not evident that as air is a highly elastic matter, it will rush round the ball with a whirlwind velocity, and that under this high pressure in front the velocity with which the particles of air move to the rear of the ball will be regulated by that pressure, and not by the known velocity of 1,400 feet in a second, which is derived from the uniform natural pressure of 15 lbs. on the square inch? Hence my conclusion is, that there cannot be any vacuum left behind a projectile at any velocity with which we can propel it; and if there were, then the flight would be accompanied by the loud noise which the collapsing of the particles of air upon each other would occasion. I therefore dissent *from the statement* that a vacuum is left behind a solid projectile, even when its velocity exceeds 1,400 feet in a second.

But let us observe what a highly respected living authority says upon this subject in his valuable treatise on Naval Gunnery, because he has adopted the popular error of supposing that the velocity with which air can rush into a vacuum is limited to 1,400 feet in the second:

"Now there is a certain limit to the velocity with which air can rush into a vacuum, viz., about 1,300 or 1,400 feet in a second, and consequently when the velocity of the ball is greater than this, it is manifest that the resistance must be increased; for there being then no pressure of the fluid behind the ball, it will have to support the whole weight of a column of the air on its fore part, as well as to give motion to the particles which it strikes; and the air which is before it will be in a very condensed state."—(*Sir Howard Douglas.* 2nd Edition, page 45, paragraph 23.)

Again, page 130, alluding to Dr. Hutton's experiments, inference 4, are these words:

"That there is a gradual and regular increase of resistance as the velocity is increased—as far as a velocity of 1,400 feet per second—when the vacuum behind the ball being complete, the resistance is greatest, and is then as the $2\frac{1}{6}$th power of the velocity nearly: *after which the resistance gradually decreases, as the velocity increases, till it arrive at about the* $2\frac{1}{10}$ *power; a law unknown till it was discovered by these experiments.*"

Sir Howard Douglas does not attempt to explain this discovery or whence the resistance decreases; but I have quoted it and marked a sentence with italics, because I draw an inference from it in favour of my opinion that *there is no vacuum left behind a projectile at any velocity.*

I propose, Sir, to proceed with my observations in your next number.

I am, Sir, yours, &c.,

SAMUEL PARLBY,

Lieut.-Col. Retired Bengal Artillery.

London, July 23, 1855.

RENTON'S PROCESS: — EXPANSIVE USE OF STEAM.

To the Editor of the Mechanics' Magazine.

SIR,—I see in the *Scientific American* of the 5th May some remarks which are a misapprehension of my notice of this process in your columns of the 7th April. I quite agree with the writer, that the existence of previous abortive attempts does not detract from, but very much enhance, the merit of conquering a difficult problem. In

[redacted]

this respect I have done more justice to Mr. Renton than has been awarded him by his own historian. He only referred to Clay's puerile effort; I pointed out the numerous other unsuccessful attempts by the first metallurgists of Britain in the same field, and thereby laid a far more extensive and solid foundation for building up the merits of success. Assuredly the glory of those who shall enter Sebastopol will be the more magnified by the previously encountered difficulties. Or to give a scientific example: Watt attempted to effect condensation of steam in tubes, to avoid the evils attending on condensation by injection; he likewise contemplated the economy of generating steam in tubes; and from his day onwards, all who have pretended to be more than rule-of-thumb engineers, and have penetrated with a scientific eye into the yet very partially developed energies of the steam engine, have more or less directed their attention to the same objects. The labour and the cost which have been expended upon perfecting a surface condenser, which may permit the constant presence of distilled water, in boilers of small tubes offering the greatest economy and safety to the generation of steam at the highest pressures, with all the subsequent enormous gain by expansion, have been persevering and excessive. So far from all these fruitless efforts detracting from the merits of the man who has accomplished them all with such perfection that his surface condenser acts without the interposition of water at all, simply by the cooling action of the air, where the situation requires it, they form a lasting substratum upon which to build the edifice of his merit. By the by, I have much wished to remark on the letter of Mr. Brownlee on expansive steam, which you rightly say is rather imperfect, but my time has not permitted me to unravel his precise object. If it be to recommend, in preference, the application of the fire of our furnaces to the *steam*, instead of *to the water*, a speedy issue might probably be arrived at, even without the aid of Regnault, whose meritorious and minute investigations it has become the fashion to quote, and yet to draw totally opposite conclusions from his details. The old law, enunciated and acted on by Watt, *contains so much* which has not yet been *brought into practice*, that we are really losing the substance by grasping at the shadow of still more refined theory and experiment. It is well to laud the public spirit of the French government for prosecuting these refinements, but it would be still better to turn to practical use what we already possess. Practice would then become the test and ground of experimental theory. If we believe not Watt and his teaching, what avails it to call one from the French to arise to persuade us?

I am, Sir, yours, &c.,
DAVID MUSHET.

July 23, 1855.

ACCIDENT AT THE NEW WATER-WORKS OF BRUSSELS.

To the Editor of the Mechanics' Magazine.

SIR,—You are, I presume, aware that a very important *projet* for supplying Brussels with water has been in a state of execution for some two years. The source of supply is situated near Braine L'Allend, about twelve miles from Brussels; the water is brought through tunnels and double lines of cast-iron pipes, 2 feet diameter, passing over "hill and vale," to two large reservoirs connected by a strong partition wall, and erected on an elevated site in the suburb of Ixelles, about 3 feet lower than the Braine L'Allend, but much higher than the city of Brussels.

Each reservoir is composed of walls 8 feet high by 3 feet 8 inches thick—of a floor made of several courses of hard burnt bricks, laid in hydraulic mortar—and of 300 brick pillars same height as walls, and 20 inches square, upon which the crossed arches are built, the span of which is about 12 feet, with a rise of 24 inches; inside dimensions 230×200 feet=46,000 square feet, or more than an acre.

Outside of the reservoirs, opposite the partition wall, is a large brick basin, about 20 feet square, into which is received the water from the source, through a movable sluice placed on one side of the basin; two similar sluices admit the water into their respective reservoirs; four others are connected to four main service pipes leading to different parts of the suburb and to the city. A waste pipe is fixed to the bottom of the basin, underneath which are two outlet pipes in connection with each reservoir; these pipes lead to a main sewer, the first to carry off surplus water, and the two others to empty their respective reservoirs when needful. The first reservoir was finished at the end of last autumn, and covered over with a thick layer of earth. It was partly filled with water about the middle of last month (June) for the purpose of testing the joints of the pipes leading from the source. It has hitherto shown no signs of failure; but the other, commenced in March last, has not had the same good luck, for after all the arches were finished and ready to be covered with their layer of earth, in the night between the 29th and 30th of last month, the whole of the arches, together with their 300 pillars, fell down with a most awful

crash! No ruin was ever more complete than this; just fancy, more than 5,000 square yards of bricks and mortar in ruins, pointing out the trouble, anxiety, and disappointment "that flesh is heir to."

A commission has been appointed to investigate this unfortunate affair, and their decision is unfavourable to the contractor, a M. Paulussen, who had to deposit 50,000 francs as caution money, on signing the contract, as a guarantee for the execution of the work within a limited time.

Pipes are being laid down in the streets, in a direct line to the park, where a display of water jets is to take place, in the new large round basin, opposite the *Chambre des Représentants*, during the September fêtes.

I have delayed writing sooner, thinking to send you a drawing of the Ixelles Reservoir, but, after some reflection, I feared it might be too large for your magazine. I have therefore decided to give you a brief description thereof, and a summary of the accident alluded to.

I remain, Sir, yours, &c.,
J. DIXON.

Brussels, July 21, 1855.

THE OFFICIAL BOARDS OF THE STATE:—

ORDNANCE SELECT COMMITTEE AND INVENTORS.

To the Editor of the Mechanics' Magazine.

SIR,—The various difficulties in the way of introducing any discovery calculated to be of importance to the public weal can be known only by one who may have unfortunately made the attempt.

Let us suppose for a moment an inventor to set about the "carrying out" process, so termed, and what has he to do? At the outset, communications pass between first one and then another public functionary, till, at last, a "committee of inquiry" is instituted. If the invention be now adjudged of sufficient merit, he is required, at his own expense, to establish a satisfactory trial of the particular advantage and utility of the discovery.

I offer no protest against this proceeding, but I do say that an inventor, in attempting it, frequently finds himself unexpectedly thwarted and embarrassed by heavy expenses, in consequence of which he fails to produce evidence sufficient to secure its *adoption*; as *approval*, merely, does not entitle, according to the regulations of Her Majesty's Ordnance Service, a consideration shown for any outlay which may have been incurred.

I ask, Sir, is it *fair* that one member of the community should suffer in his endeavours to benefit the whole? Is it *right* that any discovery embracing the general good should fail of successful development attributable to a circumstance which is altogether an *accident* of the social economy?

I may be allowed to instance the position in which I am at the present moment placed with respect to an *asphyxiating* agent recently brought under the notice of the Ordnance Select Committee. The object contemplated by the use of such an agent in the general operations of war, is certainly far more humane than either the bullet or the sword, as it would effect, in many instances, that which those could not, viz., conquest without the loss of blood. Not the slightest doubt is entertained as to the practical value of the agent in question; but it remains for me to incur all the expenses which may be required to establish the fact to the satisfaction of the committee.

I declare, Sir, in all seriousness, that I would rather undertake to put the whole garrison of Sebastopol or Cronstadt *hors de combat*—and I believe the chances of my success would preponderate—than attempt to afford satisfactory evidence in any other way.

I make these animadversions with all due respect, knowing that responsibility can only be partial where prerogative is not absolute; but, decapitate that hydra-headed monster, official routine, and all complaints will cease.

I am, Sir, yours, &c.,
THOMAS CATTELL, M.D.

Euston-square, July 12, 1855.

CALLAN'S SINGLE-FLUID BATTERY.

To the Editor of the Mechanics' Magazine.

SIR,—Allow me, through the medium of your valuable Magazine, to suggest an improvement, or what I think would be an improvement in Professor Callan's single fluid voltaic battery, I mean with regard to the second part of his last patent,* namely, the shape of the cells, which I think are calculated to diminish the action of the battery from almost its commencement, and to entirely stop it before all the fluid is fully saturated with the metals of the battery, in consequence of the saturated solution being heavier than the unsaturated, and its sinking to the bottom of the cell, and thus gradually destroying the action, while the fluid in the top or enlarged part of the cell remains nearly free from metal. This I think may be obviated by making the bottom of the cell the enlarged part instead of the top, as stated in the patent of Mr. Callan;

* See *Mech. Mag.*, vol. lxiii. p. 538 (No. 1661).

[redacted]

the saturated solution would then fall to the bottom and enlarged part of the cell, where action is not required, thus preserving the power of the battery the same until it is nearly exhausted. The bottom of the zinc plate must be coated with varnish to protect it from the acid where there is no voltaic action, or it might be suspended in the narrow part of the cell only, by a couple of wooden pegs put through the upper part of the plate and resting on the iron cell, thus saving zinc and leaving more room for acid.

Apologising for troubling you, I remain, Sir, yours, &c.,

E. W. F.

Clerkenwell, July 17, 1853.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

SEGUIN, JOSEPH, of Paris, France, civil engineer. *Improvements in obtaining motive power by the expansion of air, steam, and other fluids.* Patent dated January 1, 1855. (No. 3.)

The inventor says—"I have found that gases and vapours in contact with heated metallic surfaces become heated with great rapidity, and I am thus enabled to construct an engine acting by steam without the necessity of losing the latent heat, which is consumed in converting the liquid into vapour. My engine consists of two cylinders and pistons and two corresponding generators of a particular construction. These generators being heated to a high temperature, alternately emit and receive a column of steam, which, after acting upon the piston, returns into the generator to regain the heat expended."

CRAM, GEORGE, of Chester, iron ship-builder, and JOHN JACKSON CRANE, of the same place, painter. *An improved composition applicable to the coating of ships' bottoms, and other useful purposes.* Patent dated January 1, 1855. (No. 4.)

The improved composition is formed of the following materials, by preference in the following proportions:—112 lbs. of dry white lead; 8 lbs. of dry red lead; 6 lbs. of litharge; 3 gallons of japanners' gold size; 1 gallon of boiled linseed oil; and ½ gallon of spirits of turpentine.

GILES, STEPHEN, of Caledonian-road, Islington, Middlesex, engineer. *An improved ratchet-brace.* Patent dated January 1, 1855. (No. 5.)

This invention was described on page 846 of our last volume (No. 1653). The claim is as follows:—"The improved ratchet brace described, in which a sliding toothed paul is let into the lever of the brace, and is pressed against and into the teeth of a ratchet wheel held in the brace-head, and protected from external injury."

BRITTEN, BASHLEY, of Anerley, Surrey, gentleman. *A cheap and convenient method and apparatus for obtaining a copy of writings, drawings, or tracings in ink.* Patent dated January 2, 1855. (No. 6.)

The inventor forms a transferring apparatus, which is placed under foot and trodden upon when it is requisite to submit it to pressure.

DORMOY, HENRI LOUIS, merchant, of Paris, French Empire. *Certain improvements in manufacturing and twisting silk, cotton, wool, and other fibrous substances.* (A communication.) Patent dated January 2, 1855. (No. 8.)

This invention consists—1. In the employment of cotton, jute, or other comparatively cheap fibre for a core which is surrounded by silk or other fibre of greater value than that forming the core, adhesion being caused between the fibres by the core being coated or covered with an adhesive solution, and by the silk or outer fibre being twisted over and round the core. 2. In certain apparatus for twisting the outer covering round the core, in order to form a thread, and for combining or twisting together two or more of such threads into one, when a thick thread is required. The first apparatus consists of a bobbin holder containing a thread of the material to form the core, of cotton for example, while the outer face is to be of silk. The bobbin is free to revolve upon a pin passed through it. The cotton thread is carried up through another holder, for which purpose an aperture is made through it. Two or more bobbins containing silk threads are mounted loosely upon pins in the upper part of the holder. Above this second holder is an eye or guide through which the cotton thread is first passed, then the threads of silk, and upon rotary motion being communicated to the silk-bobbin holder, strands of silk will become twisted round the cotton core. The thread thus formed is carried upwards to a receiving bobbin or drum made to revolve and take up the threads as fast as formed. When required to twist several threads into one, bobbins free to revolve are placed upon pins over a shaft, and each thread is passed once round this shaft and next through a flyer on to a reel or bobbin. The flyer is made to revolve, and thus twists together the number of threads desired.

ARNOLD, JOSEPH, of Tamworth, Stafford. *A new mode of ornamenting bricks, and other moulded articles for building purposes.* Patent dated January 2, 1855. (No. 9.)

In order to mould bricks with ornamental surfaces, the inventor cuts or engraves a die representing the required design, and ap-

plies this die as the side of the mould in which the moulded article is to be formed. This die is not permanently fixed to the mould, but is applied in such manner as to be capable of being readily removed.

FINCKEN, CLAUDE JULES, glass merchant, of Rue de l'Echiquier, Paris, France. *Preserving, without loss of heat, all windows, glass roofs, false roofs, &c., from the effects of condensation and damp, and also from the effects of external smoke, soot, and dust.* Patent dated January 2, 1855. (No. 10.)

This invention consists in employing frames and gutters to carry away the water produced by condensation upon the interior of glass roofs, skylights, and other glazed structures, without allowing the heat to escape from, or smoke, dust, soot, &c., to be admitted to the interior of the building.

PEACOCK, GEORGE, of Gracechurch-street, London, ship-owner. *Improvements in constructing propellers for ships and other vessels.* Patent dated January 2, 1855. (No. 11.)

This invention consists in making each blade of a propeller of an open frame of wrought iron, covered with sheet iron, for the purpose of obtaining great strength in combination with comparative lightness of structure.

HARVEY, JOHN KEIR, and DANIEL PEARCE, of London, Middlesex. *A calendar inkstand.* Patent dated January 3, 1855. (No. 12.)

Claim.—The combination of a calendar with an inkstand of suitable form, the said calendar being incorporated with the body of the inkstand, or attached thereto.

DEHAYNIN, FELIX GABRIEL CELESTIN, of Paris, France. *Improvements in the purification of hydrogen gas.* Patent dated January 3, 1855. (No. 13.)

This invention consists in "the use and application to the manufacture of hydrogen gas of the method of burning the oxide of carbon by means of the water of an alkaline oxide, soda for instance, and absorbing the carbonic acid thus generated by the said alkaline oxide, or by the lime with which it is mixed; also, evolving hydrogen from the hydrating water decomposed, this hydrogen being added to that generated by the direct decomposition of water upon charcoal."

FONTAINE, HIPPOLYTE, engineer, of Marseilles, France. *Improvements in engravers' presses.* Patent dated January 3, 1855. (No. 14.)

This invention consists in the use of two printing tables, which receive an intermittent reciprocating motion in opposite directions—in a method of regulating the pressure upon the two pressing rollers simultaneously by means of screws and connecting frames—in the use of stretching rollers mounted in spring or elastic bearings, for the purpose of stretching the blanket which wraps round them and the pressing rollers, &c.

KENDALL, WILLIAM, and GEORGE GENT, of Salford, near Manchester, Lancaster, machinists. *Improvements in machinery or apparatus for cutting metals, either solid or tubular.* Patent dated January 3, 1855. (No. 16.)

Claims.—1. The construction and arrangement of machinery or apparatus for cutting metals, either solid or tubular, with the cutter working upon an axis independently of the tube or metal to be cut. 2. Making the cutter self-acting in the cut by means of a suitable mechanical contrivance.

GODDARD, SAMUEL ASPINWALL, of Birmingham, Warwick, merchant and manufacturer. *A new or improved fire-arm, a portion of which is applicable to ordnance.* Patent dated January 3, 1855. (No. 17.)

This invention consists—1. In constructing a new fire-arm by combining together any convenient number of rifle or other gun barrels, and connecting their touch-holes in such manner that the whole or a portion of them may be discharged nearly simultaneously. 2. In a method of loading by transferring the cartridges from the cartridge box in which they have been stored directly to the barrels, or through the intervention of a loading box, the transfer being effected by means of the ramrod. 3. In making cartridges of flannel or other woollen fabric which will permit of the ignition of gunpowder through it, and which will also cleanse the barrel, leaving behind no particles of ignited inflammable matter. 4. In constructing touch-holes in plugs which may, when necessary, be replaced by new ones.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *An improved system or mode of coating iron with copper.* (A communication.) Patent dated January 3, 1855. (No. 18.)

In carrying out this invention the iron, in order that it may be thoroughly cleansed, is first submitted to the action of dilute sulphuric acid until any layer or crust upon it is removed; it is then washed, first in cold water, and then in boiling water, for a few seconds. To remove the last traces of the acid the iron must be placed in a lye of caustic soda, and finally in quick lime for several weeks, at the end of which time it will have acquired a surface on which there is no extraneous matter whatever. The iron having been thus prepared must be plunged into a first bath, by which means a thin coat of copper is deposited, and the iron is thereby protected against the action of

the acid in a second bath, by which the deposition is completed, this latter bath, consisting of sulphate of copper rendered strongly acid by the addition of sulphuric acid. A thin coating of lead may be substituted for the first coating of copper if thought desirable.

HUSTWICK, CHARLES, and WILLIAM BEAN, of Kingston-upon-Hull, carriage and harness manufacturers. *Improvements in buffers and springs for railway carriages and other purposes.* Patent dated January 3, 1855. (No. 20.)

The inventor employs an arrangement of springs formed of curved steel plates and placed within a suitable box.

STOCKER, ALEXANDER SOUTHWOOD, and SAMUEL DARLING, of the Poultry, Cheapside, London, manufacturers. *Certain improvements in the manufacture of bottles, pots, jars, tubes, and other receptacles, part of which improvements are applicable to various other purposes for commercial and domestic use.* Patent dated January 3, 1855. (No. 21.)

This invention consists in forming bottles, &c., of a mixture of glue, rosin, and oil, with whiting and farinaceous or other materials, combined with pigments.

VENABLES, JOHN, and ARTHUR MANN, of Burslem, Stafford, earthenware manufacturers. *Improvements in producing raised figures or ornaments upon the surfaces of articles made of metal, pottery, and earthenware, glass, papier maché, and other materials.* Patent dated January 3, 1855. (No. 22.)

This invention consists in applying raised ornaments to articles by transferring them from engraved countersunk depressions formed in suitable metal plates, into which depressions they have been pressed in a plastic state, the transfer being made by means of a paper or other such fabric, to which they adhere, and by which they are pressed upon or into the articles to be ornamented.

VENABLES, JOHN, and ARTHUR MANN, of Burslem, Stafford, earthenware manufacturers. *Improvements in producing figures or ornaments in articles made of clay or plastic material.* Patent dated January 3, 1855. (No. 23.)

This invention comprises the preceding one together with some modifications of the same.

MUIR, GEORGE WALKER, of Glasgow, Lanark, Scotland. *Improvements in warming and ventilating.* Patent dated January 3, 1855. (No. 25.)

The invention relates—1. To forming the jambs and mantelpiece (in connection with open domestic register or other grates) hollow, and all of metal, in order that the external air, being admitted into the chambers thus formed, may be heated and discharged into the room. 2. To protecting the ends of the iron pipes employed in heating air from the action of the fire by joining a short piece of clay pipe to them. 3. To dividing a cylinder or shaft into three or more parts longitudinally, the partitions being partly constructed of perforated sheets of metal or other suitable substances set at various distances from each other. This cylinder or shaft is to be used for the ingress and egress of air to and from buildings, with provision for the collection and escape of water, and with valves to open and shut. 4. To the arrangement of a shaft for the abstraction of air from stoves or buildings into and by the draft of the furnace used in heating the same. 5. To the use of two or more sheets of perforated metal or other suitable substance for the ingress and egress of air to buildings at or near to the ridge of the roof, with provision for the collection and escape of water. 6. To the construction of chimneys or shafts formed double throughout their whole height, for the abstraction of vapour from drying stoves or apartments, and the smoke and gases from the furnace used for heating the same, the inner chimney being of metal and the outer of brick or stone. 7. To the construction of a double cowl to be fixed upon the top of the double shaft. 8. To the use of cowls for the ingress and egress of air into and from buildings, the cowls used for the admission of air having the vanes so placed as to keep the opening of the cowls towards the wind, and those used for the egress having the vanes set in the usual way. The cowl used for ingress has its mouth covered by two or more sheets of perforated metal or other suitable substance.

MARTIN, LOUIS JACQUES, of Paris, France, engineer. *Improvements in the composition of colours for printing and dyeing, and in the application of such colours.* Patent dated January 5, 1855. (No. 27.)

Claim.—The application and use of the salts of iron, whether nitrate, acetate, or sulphate, and the salts of copper, whether nitrate, acetate, or sulphate; and also the protochloride and muriate of tin for the production of black, red, and violet fast colours.

BOWDEN, GEORGE, bookbinder, of Little Queen-street, High Holborn, Middlesex *Improvements in the manufacture of united adhesive book head band and register ribbons.* Patent dated January 5, 1855. (No. 28.)

In carrying out this invention a length of cord, braid, or tape, having silk, thread, cotton, or worsted wound round it, is placed upon a strip of calico or linen and sewn to it, and to a piece of ribbon by means of a

sewing-machine, the stitch forming a chain or head.

BULMER, WILLIAM HENRY, of Queen's Head, near Halifax, machine-maker, and WILLIAM BAILEY, of Halifax, engineer, both in York. *Improvements in machinery or apparatus for combing wool, cotton, and other fibrous substances.* Patent dated January 5, 1855. (No. 29.)

This invention relates to that class of machine in which the fibre to be combed is fed by suitable feed rollers through gill combs to nipping instruments, by which it is conducted into position to be taken by a carrier or porter comb, by which it is laid on to the circle or other passing comb, thence to be drawn off, and consists in so arranging the parts actuating the nipping instruments, and the porter or carrier comb, that the movements of the nipping instruments may be increased in speed from the point of receiving fibre from the gill combs to the point of delivering it to the porter comb, and again diminished back to receive a fresh supply; whilst the movements of the porter or carrier comb are diminished in speed from the point where it receives fibre from the nipping instruments to where it lays it on to the circle or other passing comb, and then increased back to the point for receiving a fresh supply.

GIRARD, LOUIS DOMINIQUE, civil engineer, of Paris, French Empire. *Certain improvements in applying steam, fluids, and gases for the purpose of obtaining motive power, parts of which are applicable for compressing or rarefying air and gases, and for raising liquids.* Patent dated January 5, 1855. (No. 30.)

The inventor describes a machine somewhat resembling a turbine, in which the stationary curved surfaces or guides for directing the fluid on to the vanes are dispensed with, his object being to reduce as much as possible the loss of *vis viva* arising from the change which is made in the direction in which the fluid moves.

ASHWORTH, ROBERT, of Rochdale, Lancaster, engineer, and SAMUEL STOTT, of Rochdale, Lancaster, cotton spinner. *Improvements in machinery for preparing, spinning, and doubling fibrous substances.* Patent dated January 5, 1855. (No. 31.)

Claims.—1. The adaptation to and employment in frames for preparing, spinning, doubling, twisting, and winding fibrous substances of a compound spindle and tube or collar in combination with an improved flyer, &c. 2. The pressing together of the rollers used for drawing or pressing fibrous substances by means of an elastic material or spring in such manner as not to exert any force upon the bearings of the bottom or under rollers.

LIVESEY, JOHN, of Kensington Gore, Middlesex, gentleman. *Improvements in printing, and in the materials and apparatus connected therewith.* (A communication.) Patent dated January 5, 1855. (No. 32).

This invention relates—1. To the general construction and arrangement of a self-inking printing apparatus. 2. To the application and use in lithographic printing machines of large sized transfer cylinders or rollers, composed of segments of lithographic stone, bolted or otherwise secured to a suitable framework or foundation of wrought or cast iron, whereby larger printing surfaces are to be obtained than when the transfer cylinder or roller is composed of one piece of stone only. 3. To the employment of printing or transfer cylinders or rollers composed of zinc plates secured to a suitable metal frame, or of segments of wood secured to a metal frame-work or foundation, such segments having stereotype casts attached to them. 4. To a peculiar construction of damping rollers for lithographic printing machines. 5. To a peculiar construction and arrangement of rotary cutting apparatus for cutting or dividing continuous lengths or webs of printed fabric into sheets of the required size. 6. To a peculiar composition of ink which it is proposed to employ for lithographic and other printing purposes. 7. To an improved process for facilitating the obtainment of transfers from old engravings or prints.

COOK, BENJAMIN, of Green-street, Birmingham, Warwick, metallic bedstead and tube manufacturer. *Certain improved apparatus for separating filings of iron or steel from other metallic filings.* Patent dated January 5, 1855. (No. 34.)

Claim.—The separating of the particles of iron or steel from brass, copper, or other filings, by means of a revolving magnetic cylinder.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for effecting agricultural operations, parts of the said improvements being applicable for the attainment of motive power for general purposes.* (A communication.) Patent dated January 6, 1855. (No. 35.)

Claims.—1. The general arrangement and construction of apparatus as described. 2. A mode of constructing rotating digging knives or bars wherein such knives present points and inclined surfaces to the earth. 3. The application and use in digging machines of double angular edge pieces as knives or digging bars. 4. A mode of actuating the digging cylinder by means of wheels concealed within it. 5. A mode of driving and keeping up the digging bars to the area of earth to be operated upon by the

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agency of elastic frictional surface wheels or pulleys. 6. The application and use in driving the digging cylinder of certain pin-and-hole wheels or pulleys. 7. A mode of arranging and constructing tubular steam boilers wherein the upright tubes form a "hollow conical pyramidal or wedge-formed chamber."

SCOTT, JOHN, of Sunderland, Durham, blacksmith. *Improvements in the construction of anchors.* Patent dated January 6, 1855. (No. 39.)

Claim.—Forming the shanks of anchors of two plates of iron or other metal kept wholly or partially apart by means of a filling piece of wood or other suitable material, or by means of suitable enlarged portions of the plates themselves.

EDWARDS, CHARLES JOHN, junior, of Great Sutton-street, Clerkenwell, Middlesex, mill band manufacturer, and FREDERICK FRASI, of Tavistock-terrace, Holloway, engineer. *An improved manufacture of bearings for carriages, axles, and shafts of machinery in general.* Patent dated January 6, 1855. (No. 41.)

This invention consists in manufacturing bearings of leather, such bearings to be used in place of brasses and other metallic bearing surfaces, the object being to render the bearing surfaces more durable and less costly than heretofore.

CRAIG, WILLIAM GRINDLEY, of Gorton, near Manchester, Lancaster, engineer. *Improvements in railway buffer-cases and rams.* Patent dated January 8, 1855. (No. 42.)

Claims.—1. A mode of making buffer spring plungers partly of wood and partly of metal, wrought iron being preferred, the metal forming a hoop encircling the buffer head. 2. A spring bed or seat composed of a metal hoop fixed to a wooden block. 3. A mode of fixing the buffer spring plunger and the spring bed or seat so as to protect the spring from injury in case of collision. 4. The use of certain eccentric bolts for securing the ram or plunger to the spring seat or bed, and the bed to the engine tender or other vehicle.

HUGGINS, JOHN, of Birmingham, Warwick, machinist. *A new or improved machine for the manufacture of lint.* Patent dated January 8, 1855. (No. 43.)

This invention consists—1. In feeding lint-making machines by passing the fabric to be converted over a roller covered with pins. 2. In guiding the fabric by attaching it to a transverse bar sliding with friction on a table between the roller from which the fabric is uncoiled and the feeding apparatus. 3. In a method of constructing the knife-bed or surface against which the knife acts by the use of two plates of metal secured very nearly close together, the edge of the knife entering between the two plates.

McCALL, ROBERT, of Pallas-Kenry, Limerick, Ireland. *Certain improvements in the manufacture of iron and steel.* Patent dated January 8, 1855. (No. 45.)

The inventor employs, in connection with certain closed furnaces, air chambers in combination with either hot or cold blast, for the purpose of creating the necessary draught in the furnace, instead of employing a mechanical blast only when such furnaces are used for "roasting" or "torrefying" the ores of iron; and when the furnace is required to be used for the smelting of ores of iron only, the chambers are closed by dampers.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *An improved mode of obtaining alcohol.* (A communication.) Patent dated January 8, 1855. (No. 46.)

Claim.—"Extracting saccharine matter from dog's grass."

HAYES, EDWARD, of Stony Stratford, Bucks. *Improvements in apparatus for feeding thrashing-machines.* Patent dated January 9, 1855. (No. 51.)

This invention consists in employing an endless cloth of any convenient length, passing over two or more rollers which carry the corn to the drum. These rollers are supported or secured on the sides of the machine, and are caused to revolve by a strap or belt passing over a small pulley fastened to the end of one of the rollers. The endless cloth is received on leather belts and on iron rods as long as the cloth is wide, which prevent the cloth from contracting in breadth.

OFFORD, JOSEPH, of Wells-street, Oxford-street, Middlesex, coach-builder. *Improvements in the construction of carriages.* Patent dated January 9, 1855. (No. 53.)

Instead of placing the doors of the improved carriage at or near the middle of the carriage body, as is now usually the case, the inventor places them either at the fore or the hind corners, for the purpose of obtaining additional sitting room inside, and of placing the fore and hind wheels very near together.

GUESDRON, ANDRÉ GASPARD, of Paris, France. *A furniture table, which may be used for different purposes.* Patent dated January 9, 1855. (No. 54.)

The inventor constructs a new kind of table, which may easily be converted into or used as a bedstead and other articles of furniture. With this object he gives to the body part, between the four legs, depth enough for receiving and holding bedding, and the flaps of the table are hinged or otherwise fixed in various parts so that they may

be removed or turned out of the way when necessary.

AMIES, NATHANIEL JONES, of Manchester, smallware-manufacturer. *Certain improvements in winding or balling thread or yarn, and in the machinery or apparatus connected therewith.* Patent dated January 9, 1855. (No. 56.)

Claims.—1. The use of a tubular core or base of paper, cardboard, or any other suitable material, closed at one end and placed upon the spindle, for the purpose of receiving the winding-on of the cotton or thread-ball. 2. The use of two motions, one for stopping the machine when the thread or yarn breaks, the other for stopping it when the winding on of the ball is completed; as well as the general arrangement of the several parts of the machinery.

BOW, EBENEZER, of Glasgow, Lanark, North Britain, coal-merchant. *Improvements in the manufacture or production of "blackening" for foundry purposes.* Patent dated January 9, 1855. (No. 58.)

Claim.—The use of "Boghead or Torbane-hill mineral," or coal, or other argillaceous bituminous minerals embodying the general constituents of such substances, in the manufacture or preparation of blackening for foundry purposes.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

LEWIS, WALTER WILLIAM, of Hanley Castle, Worcester, gentleman. *An improvement in the manufacture of charcoal.* Application dated January 1, 1855. (No. 2.)

This invention consists in manufacturing charcoal from spent tan.

ROUILLION, ANTOINE, gentleman, of Paris, French Empire. *Certain improvements in the manufacture of soap.* Application dated January 2, 1855. (No. 7.)

This invention consists in introducing or incorporating all kinds of mineral waters, whether natural or artificial, into or with soap, or into or with any other highly divisible soluble substance. The inventor also incorporates with all kinds of soap bicarbonate of soda, salts of magnesia, of lime, &c.

LIPPMANN, ISAIE, of Rue Geoffroy, St. Hilaire, Paris, France, tanner. *An improved machine for splitting or sawing the skins of calves, oxen, cows, horses, and other animals.* Application dated January 3, 1855. (No. 15.)

The inventor describes a machine which is furnished with an arrangement of mallets that strike the skin in a slanting direction, and with means for regulating the speed of the cylinder that feeds the saw.

GASKELL, JACOB, of Manchester, button-manufacturer, and GEORGE HOLCROFT, of the same place, consulting engineer. *Improvements in the manufacture of mortar and cement.* Application dated January 3, 1855. (No. 19.)

This invention consists in employing the refuse lime of gas-works in the manufacture of mortar and cement.

RAMMELL, THOMAS WEBSTER, of Trafalgar-square, Middlesex. *Improvements in boiler and other furnaces.* Application dated January 3, 1855. (No. 24.)

The inventor describes an arrangement of furnace, intended chiefly for burning anthracite, in which there are two sets of bars, one higher than the other, the upper set being broad, and formed of fire-clay, and the lower set being placed beneath the spaces between the upper ones, and broader than those spaces.

WATT, CHARLES, of Victoria-wharf, Regent's-park Basin, chemist. *An improvement in preparing coffee.* Application dated January 4, 1855. (No. 26.)

This invention consists in causing coffee-berries to be first broken or ground, and then roasted.

PRINCE, FREDERIC, of South Parade, Chelsea, Middlesex. *Improvements in cartridges for fire-arms.* Application dated January 5, 1855. (No. 33.)

This invention consists in a mode of combining together an expanding cone-ball, an elastic wadding, and the cartridge containing the necessary charge of powder, so as to dispense with the necessity of biting off or tearing away any part of the cartridge when using it.

DELABARRE, TOUSSAINT and ANGÉLINE BONNET, of Paris, France. *Improvements in the preservation of substances for food.* Application dated January 6, 1855. (No. 36.)

The inventors propose to preserve meat, poultry, bread, eggs, vegetables, and pastry, by coating them over with a varnish made from the flesh and bones of animals, from which they obtain (by boiling) a syrup which is clarified by means of albumen and alcohol.

JOY, DAVID, of Worcester, engineer. *An improvement in pistons.* Application dated January 6, 1855. (No. 38.)

This invention consists in cutting a spiral groove of about three turns round the piston, into which groove is fitted a spirally-wound rod of brass, which forms a packing.

COTTAM, GEORGE HALLEN, and HENRY RICHARD COTTAM, of St. Pancras Iron-works, Old St. Pancras-road. *An improvement in the manufacture of iron bedsteads.* Application dated January 6, 1855. (No. 40.)

This improvement consists in employing

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in the manufacture of bedsteads iron coated with brass deposited from solutions by electric currents, the deposition of the brass being made on some of the parts before, and on others after they are formed.

PLAYER, JOSEPH, of Winchester-buildings, London, civil engineer. *Improvements in the construction of furnaces for the prevention of smoke.* Application dated January 8, 1855. (No. 44.)

In carrying out this invention, a supply of fuel is kept constantly on the top of a mouth-piece or hopper, and the parts are so arranged that, by agitating a lever, a small quantity of fuel is allowed to fall on to a heated plate at the bottom of the mouthpiece, in front of the dead plate, and having remained there a sufficient time, is then pushed forward on to the fire-bars by means of a rod and plate. The furnace-door is furnished with three holes, one of which is fitted with a piece of talc, through which the attendant may see into the furnace; the second is for working the rod and plate before mentioned through; and the third is for passing a poker through.

HAY, WILLIAM, and JAMES HAY, of Glasgow, Lanark, North Britain, engineers. *Improvements in engines for obtaining motive power.* Application dated January 8, 1855. (No. 47.)

In the engine described by the inventor a stud furnished with an antifriction roller is fitted into the head of the piston-rod, and the roller runs under spiral grooves in a drum to which it imparts a continuous rotatory motion, the change of stroke being provided for in the form of the groove.

NAGLES, ALBERT, of Ghent, Belgium, chemist. *Improvements in machinery or apparatus for cleaning the surfaces of woven fabrics, and also for distending or spreading the same either before or after, or during the processes of bleaching, printing, or other similar operations.* Application dated January 8, 1855. (No. 48.)

The improved apparatus for cleaning the fabrics is a rapidly-revolving roller furnished with brass or other metallic knives or blades wound like the threads of quick-threaded screws around the said roller, which, acting against the back and front of the cloth, clean or scrape off all loose matters, knots, &c. The distending apparatus is composed of two small rollers, screwed or threaded in opposite directions, so as to produce a continuous strain upon the fabric as they rotate.

BURY, ISAAC, of Manchester, Lancaster, embosser and finisher. *A certain improvement in embossing Orleans cloth, or other similar fabrics, commonly called stuff goods.* Application dated January 8, 1855. (No. 49.)

This improvement consists in submitting such goods or fabrics to the operation of a combination of two embossing rollers, which have different patterns or devices formed upon them, and which enable one pattern or device to be embossed over or upon the other.

HODGSON, THOMAS, of Morley's Hotel, Westminster, architectural modeller. *An improved construction of paddle-box life boat.* Application dated January 9, 1855. (No. 52.)

In carrying out this invention the inventor so constructs the upper parts of paddle-boxes as to admit of their being readily detached from the ship and thrown or launched into the sea.

HALL, HENRY JOHN, of Charlton, Kent, commander in the Royal Navy, and ALEXANDER DALGETY and EDWARD LEDGER, both of Deptford, Kent, engineers. *Improvements in apparatus for propelling, guiding, or manœuvring ships or boats.* Application dated January 9, 1855. (No. 57.)

This invention consists in the application of four jets of water or air for guiding or manœuvring ships and boats, such jets being obtained from a rotatory pump or other suitable forcing apparatus situated in the interior of the vessel, and in connection with four pipes, two of which open at the side of the bows, and two at the stern.

PROVISIONAL PROTECTIONS.

Dated April 25, 1855.

922. Alfred Crosskill, of Beverley, York, civil engineer. Improvements in machinery for cutting and reaping corn, grass, and other crops.

Dated May 26, 1855.

1198. Jean Ciancaleone Ricu and Carlo Bartocci, of Fuligno, in the Papal States. A new beverage.

Dated June 4, 1855.

1270. Horace John Kaye, of Denbigh street, Belgrave-road, London, civil engineer, and Percy Burrell, of the Hermitage, Camberwell-grove, gentleman. An improved mode of communicating to each of two trains that are in motion the distance they respectively are from each other.

1274. George Green, of Mile-end-road, Middlesex, engineer. Improvements in sawing-machinery.

Dated July 3rd, 1855.

1499. Robert Muckelt, of Salford, Lancaster, engraver. Improvements in machinery for etching or engraving designs on cylindrical or other surfaces.

Dated July 4, 1855.

1500. George Guillaume, of Marland-place, Southampton, architect. Certain improvements in machinery for communicating power to the wheel or axle of steam or other engines, or for carriages to be propelled by hand or foot.

1501. George Antoine Tabourin, of Lyons, France, student. A new system of metallic arch, proper for the construction of bridges, arcades, vaults, roofs, and all other such purposes.

1502. Richard Tidmarsh, of Foxley House, Foxley-road, Surrey, engineer. An improved apparatus for lubricating metallic and other surfaces when in motion.

1503. William Clay, of Liverpool, Lancaster, iron-merchant. An improved mode of manufacturing forged iron.

1504. Charles Hide, of Worthing, Sussex. Improvements in connecting earthenware pipes or tubes.

1505. John Inglis, of Glasgow, Lanark, iron-founder, and Archibald Cowie, of the same place, pattern-maker. Improvements in moulding or shaping metals.

Dated July 5, 1855.

1506. Samuel Griswold Flagg, of Philadelphia, United States of America. An improved folding-boat. A communication from Abijah R. Tewksbury, of Boston, United States of America.

1507. James Connor, of Coventry, Warwickshire, carver and gilder. Improvements in apparatus for communicating between the engine-drivers and the guards of railway-trains.

1508. William Gerhardi, of Manchester, mechanic. Improvements in safety-valves and apparatus for regulating the pressure of steam and the quantity of water in steam-boilers.

1509. Samuel Oddy, of the Adelphi Iron-works, Salford, Lancaster, machine-maker. Improvements in constructing and lubricating the bearings of mule-spindles.

1510. Joshua Horton, of Birmingham, Warwick, manufacturer, and Thomas Horton, of Birmingham, manufacturer. A new or improved manufacture of paper, pasteboard, and pulp.

1511. James Howard, of Bedford, iron-founder. Improvements in the construction of ploughs.

1512. Thomas Felton, of Edgbaston-street, Birmingham, Warwick, glass chandelier and lustre manufacturer. Improvements in glass reflectors for gas and other artificial lights.

1513. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of figured net and other like open fabrics. A communication.

Dated July 6, 1855.

1514. Jacob Vale Asbury, of Enfield, Middlesex, surgeon. Improvements in apparatus for neutralizing the effect of collision or impaction in railway-trains, stations, and other similar situations.

1515. James Bullough, of Accrington, Robert Willan, of Blackburn, and John Walmsley, of Accrington, Lancaster. Improvements in machinery or apparatus for warping by power.

1516. Julien Arnold Bellay, manufacturer, of Paris, French Empire. Improvements in manufacturing articles of earthenware and china.

1517. William Balk, of Ipswich, Suffolk, engineer. Improvements in the construction and combination of parts of portable steam-engines.

1518. Anguish Honour Augustus Durant, of Tong Castle, Salop, esquire. An improvement in extracting castor-oil.

1519. William Richard Morris and William Morris, of Deptford, Kent, engineers, and Richard Chrimes and George Eskholme, of Rotherham, York, brass-founders. Improvements in the construction and arrangement of apparatus for preventing the waste of water from service-pipes or cisterns.

1520. James Beckett, of Preston, Lancaster, overlooker, and William Seed, of the same place, machine-maker. Improvements in machinery for spinning cotton and other fibrous substances.

1521. William Boyes, of Preston, Lancaster, manufacturer. Improvements in looms for weaving.

Dated July 7, 1855.

1522. John Gedge, of Wellington-street South, Middlesex. Improvements in aërated waters. A communication from C. P. Guettier, of Mans, France, chemist.

1524. Edward Vansittart Neale, of Russell-place, Fitzroy-square, Middlesex, esquire. Improvements in the application of vitreous substances to the manufacture of labels, tablets, finger-plates, tiles, and other architectural decorations.

1525. John Pym, of Stanley-street, Pimlico, Middlesex, engineer. A new combination of materials suitable for building purposes.

1526. Edwin Yates, of Birmingham, Warwick, manufacturer. A new or improved dinner and dessert-fork.

1527. Christian Friedrich Werner and Loudovicus Piglhein, of Hamburg, manufacturers of furniture. An improved manufacture of elastic stuffing for chairs, couches, and other articles requiring the same.

1528. Alexander White, of Glasgow, Lanark, miller. Improvements in grinding or reducing grain and other substances.

1529. Ezra Washington Burrows, of Clerkenwell, Middlesex, civil engineer. Improvements in machinery adapted for increasing the efficiency of steam-engine and other power.

Dated July 10, 1855.

1538. George Riley, of Portland-place North, Clapham-road, Surrey. An improvement in the construction of mills for grinding malt and other articles.

1542. Henry Edward Flynn, of Retreat, Ranelagh, Dublin, gentleman. Improvements in preventing the evil effects of the recoil of cannon.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1567. Charles Byrne, of Dublin, fish-dealer. A preparation of a certain kind of fish combined with pepper, wine, and other condiments, which preparation may be used for sandwiches. July 13, 1855.

1599. William Pidding, of Putney, Surrey. Improvements in coverings for the feet of bipeds and quadrupeds. July 17, 1855.

1600. William Pidding, of Putney, Surrey. Improvements in the manufacture of building materials. July 17, 1855.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," July 24th, 1855.)

554. William Score. An improvement in bleaching oils, fats, and resin.

565. George Riley. An improved process for the manufacture of starch or grape sugar.

571. Jonas Marland. An improvement or improvements in the manufacture of rollers for drawing, spinning, doubling, and preparing cotton, wool, flax, and other fibrous materials, a part or the whole of which improvement or improvements are applicable to shaping metals for other purposes.

576. Julian Bernard. Improvements in the manufacture of boots and shoes, or other coverings for the feet, and in the machinery connected therewith.

580. John Hetherington and Archibald Vickers. Improvements in machinery for preparing, spinning, and doubling cotton, and other fibrous materials.

583. Nathan Robinson, John Lister, and Henry Stevenson. Improvements in looms for weaving cocoa-nut matting and similar fabrics.

600. John Henry Johnson. Improvements in the application of carbonic acid gas as a motive power. A communication from Joseph Ghilliano,

[redacted]

of Marseilles, France, chemist, and Henri Cristin, of the same place, gentleman.

612. Felix Alexis Chartraire. A new apparatus for fastening gloves, collars, shirts, and other similar articles.

624. Charles Marsden. An improvement in tent-poles.

630. Alfred Vincent Newton. Improved machinery for forming moulds for casting.

634. James Biden. Improvements in marine steam engines.

689. George Hall Nicoll. Improvements in laundry stoves.

705. Anatole Bère. Improvements in steam boilers.

710. George H. Babcock and Asher M. Babcock. Improvements in presses for printing in colours, called polychromatic printing presses.

834. Henry Holmes. Certain processes of treating the human body by gases, vapours, and electricity, and for certain apparatus for obtaining and applying the said gases, vapours, and electricity to the above or any other purposes.

886. Richard Bright. Improvements in lamps and in lamp-wicks.

925. John Joseph Victory. Certain apparatus for marking out curved lines upon wood and stone, specially adapted for the marking out of hand railings, together with improved machinery for boring and sawing wood.

941. John Silvester. Improvements in spring balances and in their connection and adjustment to steam valves.

974. George Wigzell Knocker. Improvements in motive power by means of water and air.

983. Thomas Lambert. Improvements in pianofortes.

995. William Henry Marks. Signalling the approach of vessels at sea.

1081. John Dupre. Improvements in the construction of ovens. A communication.

1222. Richard Coleman. Improvements in the construction of land rollers and in implements for ploughing and breaking up or scarifying the soil.

1274. George Green. Improvements in sawing machinery.

1303. Richard Peters. Improvements in the manufacture of ordnance shells and other hollow vessels.

1385. Thomas Blanchard. A new and improved method of bending timber.

1410. Robert Walker. Improvements in electric telegraphs.

1451. Sydney Smith. Improvements in apparatus for insuring the correct action of the safety-valves of steam-boilers, and for regulating the action of the dampers of steam-boilers.

1475. Simon Davey. An improvement in the manufacture of safety fuzes for mining and military purposes.

1482. Claude Antoine Busson. An improved mode of constructing and fixing the teeth of toothed cylinders employed in the treatment of textile or fibrous materials.

1497. William Knapton. Improvements in furnaces for effecting the consumption of smoke.

1502. Richard Tidmarsh. An improved apparatus for lubricating metallic and other surfaces when in motion.

1505. John Inglis and Archibald Cowie. Improvements in moulding or shaping metals.

1514. Jacob Vale Asbury. Improvements in apparatus for neutralizing the effect of collision or impaction in railway trains, stations, and other similar situations.

1519. William Richard Morris, William Morris, Richard Chrimes, and George Eskholme. Improvements in the construction and arrangement of apparatus for preventing the waste of water from service pipes or cisterns.

1528. Alexander White. Improvements in grinding or reducing grain and other substances.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed July 13, 1855.

50. Samuel Smith Shipley.
109. Urbain Charles Choisnet and Charles Emile Giajola.
118. George William Garrood.
120. Joshua Horton.
125. James Higgins.
127. Edward Hall.
149. Thomas Coëndos Hill.
158. Auguste Edouard Loradoux Bellford.
162. John Gedge.
174. William Dray.
176. James Fenton.
187. Barnett Samuel.
190. Alexander William Anderson.
208. Samuel Mayer and William Bush.
242. Auguste Edouard Loradoux Bellford.
264. Auguste Edouard Loradoux Bellford.
265. John Henry Johnson.
285. Peter Armand Lecomte de Fontainemoreau.
561. John Gracie.
877. John Charles Pearce.
893. Henri Schoofs.
1083. William Robertson.
1103. Alphonse René Le Mire de Normandy.

Sealed July 14, 1855.

105. James Peter Lark.

Sealed July 17, 1855.

133. Evan Leigh.
151. William Smith and Thomas Phillips.
160. William Eisenmann.
168. François Arsène Vasnier.
177. George Brooks Pettit and Henry Fly Smith.
182. John Livesey.
194. Richard Archibald Brooman.
197. William Binns and James Haughton.
522. John Norton.
841. Philippe Amédée Devy.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
July 9	3734	Abbott and Forest	Blackburn	Steam Valve.
16	3735	J. W. and T. Allen	Strand	Folding Bedstead.
,,	3736	F. W. Ralph	Throgmorton-street	Envelope Paper.
17	3737	A. H. Jones	Helmet-row	Pocket Detector.
24	3738	W. N. Nicholson	Newark	Washing Machine.
,,	3739	T. Green	Leeds	Mowing Machine.

PROVISIONAL REGISTRATIONS.

June 29	675	J. Moon	Malton	Bath.
July 2	676	Carrett, Marshall, and Co.	Leeds	Engine and Boiler.
4	677	G. B. Davis	Halifax	Vest.
7	678	B. Gordon	Goodman's-fields	Reckoner.
11	679	G. J. Calvert	York	Cooking Apparatus.
12	680	D. S. Brown	Old Kent-road	Aerial Machine.
18	681	J. Moon and G. Andrews	Malton	Oat Bruiser.
21	682	W. Ryan	Dublin	Hoop-bending Machine.

NOTICES TO CORRESPONDENTS.

R. N. B.—The only risk you run is that you may have been forestalled by the person who has already obtained protection. We shall be happy to render you any assistance you may require.

H. C. Gover, and *W. H.*—Your communications (relating to a Compass, and a Steering Apparatus respectively) have been received, and shall be inserted as opportunity offers.

Juvenis Inventor.—If you will forward us a fuller and more detailed description of your water-clock arrangement it shall be inserted.

Alpha.—We have no information relating to the subject you refer to.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

[redacted]

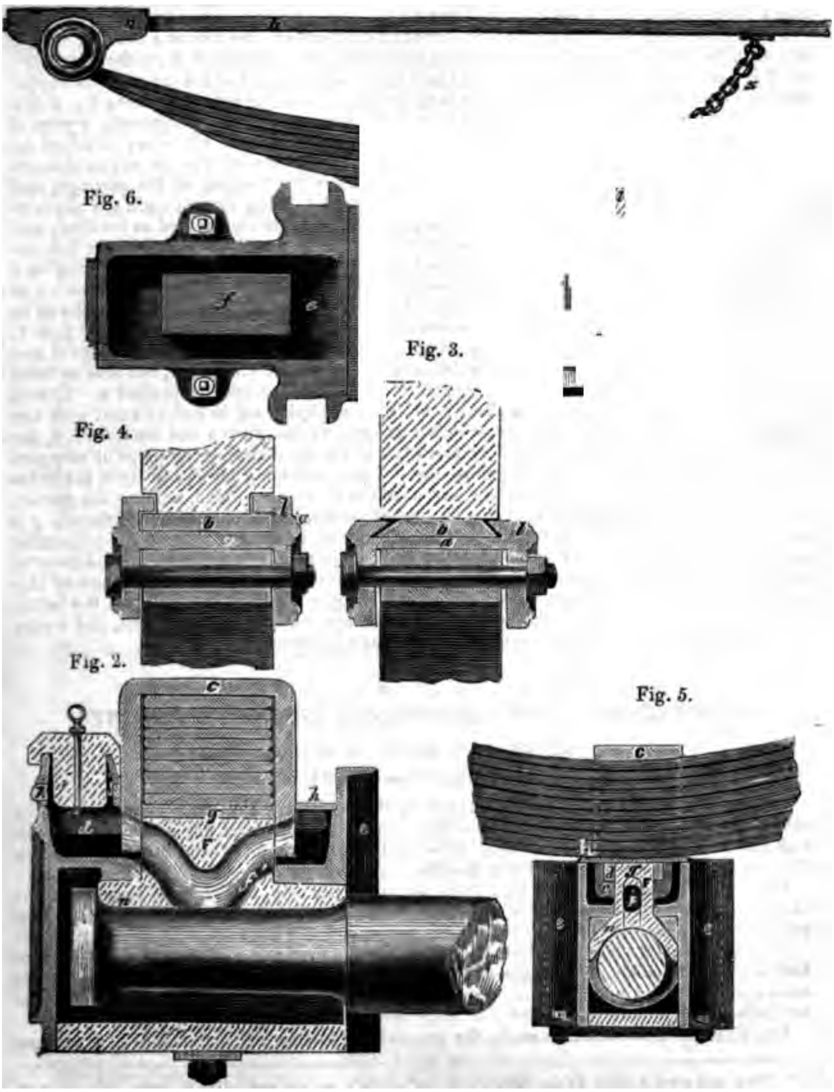
Mechanics' Magazine.

No. 1669.] SATURDAY, AUGUST 4, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

CRAIG'S PATENT RAILWAY AXLE-BOXES AND SPRING FITTINGS.

Fig. 1.



CRAIG'S PATENT RAILWAY AXLE-BOXES AND SPRING FITTINGS.

(Patent dated December 11, 1854.)

Mr. W. G. Craig, of Gorton, has recently completed a patent for improvements in the axle-boxes and spring fittings of railway carriages. The invention comprises a new description of axle-box grease cover, in combination with a separate cup and plug, to prevent the entrance of dust, grit, and other materials injurious to the bearings—a method of fixing a sliding shoe, which yields to the play of the springs, to the ends of bearing, buffing, and draw springs—a new description of strap, and framing for the same, for bearing springs—and the use of a projecting piece on the back of the bearing, which is made to fit into a recess in the under side of the spring strap.

Fig. 1 of the engravings on the preceding page represents a side view of a bearing spring and axle-box, with the parts in connection therewith, shown detached from the carriage; fig. 2 is a section of the axle-box and end part of the axle; figs. 3 and 4 are sections representing the manner of connecting the ends of the spring and the shoes together; fig. 5 is a longitudinal section of the axle-box and part of the spring; and fig. 6 represents a plan of he axle-box. *a*, *a*, represent the improved sliding shoes. These shoes are attached by means of bolts to the turn-over ends of the spring S, and have each a recess cut in them to receive the spring. *b*, *b*, is a bed, which is fixed upon the framing of the carriage, and upon which the shoes are free to slide, a lip or flange *l*, *l*, being formed upon the shoes to guide them upon the bed. In fig. 3 the flanges or lips *l*, *l*, are represented as bevilled, and the edges of the bar *b* chamfered off to fit them, while in fig. 4 the edges of the bar are square, and fit into corresponding square recesses *l*, *l*, in the shoe. Other forms and varieties of shoes may be used, but the inventor prefers in practice the forms represented in the engravings. By means of these shoes and bed, a greater freedom of action is given to the springs, and less friction at their points of connection with the carriage. *c*, *c*, figs. 1, 2, and 5, are the improved spring clips or straps, which are secured to the springs S and axle-box by means of the cotters *d*, *d*, which serve to bind them altogether, and also to form a recess between the cotters for the reception of the head of the brass or journal *n*. *h*, *h*, is an intermediate plate of iron, which forms the lid of the axle-box, in combination with the piece of wood *k*; *j* is the grease-cup, which is secured to the plate *h* and wood *k*; *i*, *i*, are plugs or stoppers to the grease-cups *j*; and *s* is a chain, for fastening the plugs or stoppers to the carriage, to prevent their becoming lost; F is a projecting piece, cast upon the brass or bearing. This brass is made hollow, and passages f^1, f^1, are formed, to allow the grease, oil, or other lubricating material to flow through from the grease-cup on to the journal. *g* is a strip of India-rubber, or other suitable elastic material, interposed between the projecting piece F and plate *h*, in order to obviate the evils of jarring, arising from the ordinary or present mode of bringing two metals together in railway rolling stock. By means of this arrangement of axle-box, cover, grease-cup, and plug, a regular pressure upon the lubricating material in the grease-cup is obtained, and also a non-conductor of heat, and a very efficient exclusion of dust, grit, and other injurious substances.

ON WORKING STEAM EXPANSIVELY IN MARINE ENGINES.

BY MR. E. A. ALLEN, OF LONDON.

(*Continued from page* 80.)

Table V. gives the total space occupied by the machinery and coals relatively to the entire hulls, and includes the averages of six vessels with side-lever engines, and six vessels with direct-acting engines, all belonging to the Peninsular and Oriental Steam Navigation Company; also the average of 1,200 English merchant vessels.

From this Table it appears that from 34 to 44 per cent. of the *whole capacity* of the vessels is occupied by the engine-room and coals. The Table also gives the most general proportion of power to tonnage as one horse-power to every three tons.

[The author next gives in Tables VI. and VII.* the particulars of several steamers, with both screw and paddle-wheel engines, from which the comparative spaces occupied by the coals and machinery may be seen. From these Tables he deduces the following important particulars.]

1st. That in Government vessels the general proportion of coal taken is 1 ton per

* These and several other Tables, which occur afterwards, we are compelled to omit. We are, however, careful in all cases to give the results deduced from them, which will be sufficient for the objects of the paper.—*Ed. M. M.*

[redacted]

nominal horse-power, equal to about $1\frac{1}{2}$ times the gross weight of machinery, as before given.

TABLE V.

Average Registered Tonnage.	Average Tonnage of Engine-room.	Average Total Tonnage.	Average Horse-power.	Per-centage of Engine-room to Total Tonnage.	Average total Tonnage per Horse-power.
Average of 6 Side-lever Engines, P. and O. S. N. Co.					
1156	913	2069	636	44 per cent.	3·25
Average of 6 Direct-acting Engines, P. and O. S. N. Co.					
1659	854	2513	794	34 per cent.	3·16
Average of 1200 English Merchant Steamers.					
138	108	246	83	44 per cent.	2·95

2ndly. That the horizontal space occupied by the entire engine-room, when this proportion of coal is taken, is about $4\frac{1}{2}$ square feet per nominal horse-power.

3rdly. That the space occupied by the coal-bunkers carrying this proportion of fuel, may be taken at 2 or $2\frac{1}{4}$ square feet per horse-power, or about three times the space occupied by the engines alone, exclusive of boilers, passages, &c.

4thly. That the space occupied by the engines alone, exclusive of boilers, coal-bunkers, and passages, may be taken at $\frac{3}{4}$ square feet per nominal horse-power, that is, where the engines are direct-acting.

From an average of the eighteen estimates furnished to Government by different makers, and from some other cases, it appears that the space occupied by the boilers alone may be taken at about 1 square foot per nominal horse-power, and that the total price of £43 per horse-power for the machinery may be thus divided:—

	£	s.	d.	
Engines, boilers, and coal-bunkers........	38	0	0	per horse-power.
Wheels	2	10	0	,, ,,
Spare gear	2	10	0	,, ,,
Total..............	£43	0	0	,, ,,

The amount for engines, &c., may be divided nearly as follows:—

	£	s.	d.	
Engines	24	0	0	per horse-power.
Boilers	12	0	0	,, ,,
Coal-bunkers.........................	2	0	0	,, ,,
Total..............	£38	0	0	,, ,,

These proportions will be quite near enough for the purpose required, and the relation they bear to each other will not be much influenced by the present increased prices. It will therefore be assumed that the cost of the engines alone is about one half the entire cost of machinery.

It will be requisite further to consider the average *annual expense* of the coal used by steam vessels, and its proportion to the cost of the vessels or capital; this depending partly upon the class of vessel, and partly upon the service upon which she is engaged.

[In Table VIII. the author gives an approximation to the yearly cost of coal used by five classes of vessels, with the relation it bears to their cost.]

These comparisons will be found useful when the advantages of increasing the size of the engines are considered.

The cost of coal in London is taken at 16*s*. per ton.

The cost of coal in Liverpool is taken at 12*s*. per ton.

The cost of coal for Australian vessels at an average of 60*s*. per ton.

The cost of coal for Eastern Steam Navigation Company at 12*s*. per ton.

The price of coal is sometimes above these amounts, but they are near enough to illustrate the argument intended.

For better comparison, it will be desirable to condense the results, and this Table gives us the cost of engines alone (assumed at half the total cost of machinery) in

Classes* 3, 4, and 5, at 15 per cent. of the capital;
Class 2 ....at 20 per cent. of the capital;
Class 1 ....at 30 per cent. of the capital.

Also the yearly cost of coal in

Classes 2, 3, and 5, at say 5 per cent. of the capital;
Class 1 ....at say 15 per cent. of the capital;
Class 4 ....at say 25 per cent. of the capital.

In further illustration of this part of the subject, the subjoined accounts are added.

[In Table IX. is given by the West India Mail Steam Packet Company an account, showing the relative cost of coal, wages, &c., for 1850 and 1852, from which it appears that the cost of coals in 1850 was equal to 30 per cent. of the total working cost, and in 1852 equal to 35½ per cent.; and in Table X. is given the total actual expenses of coals, wages, &c., of the same Company for the year 1850, and the per-centages of these items on the total cost of vessels.] This Table gives the cost of coals in 1850 equal to 28 per cent. of the working expenses, and nearly 13 per cent. of the total cost of vessels, and the whole working expenses at 45½ per cent. of the cost of vessels. If the mileage working expenses for 1850 be taken to amount to 45½ per cent. of the capital, then in 1852 the same expenses would be 53½ per cent., and from the respective ratios of the cost of coals to the total working expenses for those years, we have 13·74 per cent., and 19·02 per cent. as the cost of coals on the capital; consequently 15 per cent. may be fairly taken as a mean.

For easy reference the following Table XI. is given:—

TABLE XI.

When the Annual Cost of Coal on Capital amounts respectively to	5 per cent.	15 per cent.	25 per cent.
Then 10 per cent. saving in Coal equals	½ per cent. on capital.	1½ per cent. on capital.	2½ per cent. on capital.
„ 20 „ „ „ „	1 „	3 „	5 „
„ 30 „ „ „ „	1½ „	4½ „	7½ „
„ 40 „ „ „ „	2 „	6 „	10 „

As the least of these savings, in the middle column, frequently makes all the difference between a good and bad paying concern, it is quite certain that upon the expenses of the single item of coal may frequently hang the very existence of a Company.

It will be seen from the foregoing accounts, that there is little room for economizing the expenditure upon any other item, to anything like the extent possible in the item of coals alone. as the largest amount next that for coals, according to the mileage expenses, is for wages or repairs, each of these amounting to only about half the cost of the coals.

The following Tables XII., XIII., XIV., have been compiled in order to show the increased dividend on original capital which may be made by a saving in coal, owing to expansive working of the steam, the size or nominal horse-power of the engines being supposed to be increased from 1 to 1½, 2, 2½, and 3 times respectively, the extra cost of larger engines being proportionately allowed for, and the boilers and wheels or screw supposed to remain the same. The indicated or real horse-power is also supposed to remain the same, the larger engines being solely for the purpose of working the steam expansively. The first Table XII. is based on the supposition that the annual cost of coals is equal to 5 per cent. on the capital, and nearly agrees with the classes of vessels numbered 2, 3, and 5 in the Table VIII.

This proportionate cost of coals is here applied to cases in which the cost of the engine-power (exclusive of boilers, wheels, or screw), is equal to 15 per cent. of the capital, say as in Classes 3 and 5, and also to cases in which the cost of the engine-power is 20 per cent. of the capital, as in Class 2. Column A gives the proportionate size or nominal

* These classes are as follows:—1. *River.* 2. *Continental.* 3. *American.* 4. *Australian.* 5. *Eastern Steam Navigation Company.*

[redacted]

horse-power of engines; column B, the proportionate quantity of coal required to develop an equal amount of power (in each case); column C, the proportionate cost of coal in per-centage of capital; column D, the proportionate saving in cost of coal in per-centage of capital, from which it appears that if the size of the engines be doubled, the saving is 1·45 per cent. on the capital, and if the size of the engines be increased to three times, the saving is 2·15 per cent. on the capital. From this saving on the item of coal, however, must be deducted the interest on the extra cost of larger engines, and this deduction will vary according to the proportionate expenses of the engines to the capital. Columns E, F, G, apply to the case in which the cost of the engines alone (exclusive of boilers, wheels, or screw) amounts to 15 per cent. of capital (as in American vessels, and the Eastern Steam Navigation Company); and columns H, I, J, to the case in which the cost of engines alone amounts to 20 per cent. of capital, as in continental steamers, &c.; columns E and H give the necessary per-centage of increase of capital; columns F and I the permanent charge on capital, being 5 per cent. allowed on the necessary addition made to it; and columns G and J, the gross gain in per-centage of capital, after deducting the interest on extra cost of engines from the total gain or saving in coal. The results in this Table show that if the size of the engines be doubled, an additional 0·70 or 0·45 per cent. may be paid on capital, and that upon the engines being increased to three times the size, an additional 0·65 or 0·15 per cent. may be paid on capital, according as the cost of the engine-power amounts to 15 per cent. or 20 per cent. of the capital respectively.

TABLE XII.

Table showing the Increased Dividend on Capital, by a Saving in Coal from Expansive Working; the extra Cost of larger Engines being taken into account; Boilers, Wheels, or Screw, and Indicated Horse-Power being supposed to remain the same.

Proportional Nominal Horse-Power, or Size of Engines.	Proportional Cost of Coal for same actual Power.	ANNUAL COST OF COALS TAKEN AT FIVE PER CENT. OF CAPITAL.							
				Cost of Engines alone (exclusive of Boilers, Screw, &c.) equal to 15 per cent. of Capital (say as in Classes 3 and 5).			Cost of Engines alone (exclusive of Boilers, Screw, &c.) equal to 20 per cent. of Capital (say as in Class 2).		
		Cost of Coal in per centage of original Capital.	Saving in Cost of Coal in per centage of original Capital.	Increasing the Nominal Horse-Power, adds to Capital Invested.	Permanent charge on Capital, being 5 per cent. on Addition.	Gross gain on Capital, deducting amounts in F from D.	Increasing the Nominal Horse-power, adds to Capital Invested.	Permanent charge on Capital, being 5 per cent. on Addition.	Gross gain on Capital, deducting amounts in I from D.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	1·00	5·00	..	..	..	..	..	..	..
1½	·81	4·05	·95	7·50	·37	·57	10·00	·50	·45
2	·71	3·55	1·45	15·00	·75	·70	20·00	1·00	·45
2½	·63	3·15	1·85	22·50	1·12	·72	30·00	1·50	·35
3	·57	2·85	2·15	30·00	1·50	·65	40·00	2·00	·15
A	B	C	D	E	F	G	H	I	J

The second Table, XIII., is constructed in the same manner as the first, the annual cost of coals being taken at 15 per cent. of the capital, which, as before-mentioned, applies to the class of vessels marked 1, and the West India Mail boats. This annual cost of coals is applied to the cases in which the cost of engines (exclusive of boilers, wheels, or screw), amounts to 20 per cent. of the capital, and also to the cases in which the cost of engines alone amounts to 30 per cent. of the capital; the general results are, that if the engines be increased to double the size, for the sake of expansive working, the saving of coal would be 4·35 per cent. of capital, and if the engines be increased to three times the size, the saving in coal would be 6·45 per cent. of capital. These amounts are reduced by the extra cost of engines respectively to 3·55 per cent., and 2·85 per cent. of capital, and to 4·45 per cent., and 3·45 per cent of capital, according as the cost of engine-power amounts to 20 per cent. or 30 per cent. of capital.

The third Table, XIV., is constructed in the same manner as the two former ones, the annual cost of coals being taken at 25 per cent. of the capital, which, as shown before, applies to the Australian vessels, or class 4, where the cost of engines alone (exclusive of boilers, wheels, or screw), is equal to about 15 per cent. of capital. The results are, that if the

size of the engines be doubled for expansive working, the saving of coal would amount to 7·25 per cent. of capital, and if increased to three times the size, the saving of coal would amount to 10·75 per cent. of capital. These amounts are reduced by the extra cost of engines to 6·50 per cent. and 9·25 per cent. of capital.

TABLE XIII.

Table showing the Increased Dividend by a Saving in Coal from Expansive Working, the extra Cost of larger Engines being taken into account; Boilers, Wheels, or Screw, and Indicated Horse-Power being supposed to remain the same.

Proportional Nominal Horse-Power, or Size of Engines.	Proportional Cost of Coal for same actual Power.	ANNUAL COST OF COALS TAKEN AT FIFTEEN PER CENT. OF CAPITAL.							
		Cost of Coal in per centage of original Capital.	Saving in Cost of Coal in per centage of original Capital.	Cost of Engines alone (exclusive of Boilers, Screw, &c.) equals 20 per cent. of Capital, (as in West India Mail-Boats.)			Cost of Engines alone (exclusive of Boilers, Screw, &c.) equals 30 per cent. of Capital, (as in River-Boats, Class 1.)		
				Increasing the Nominal Horse-Power, adds to Capital Invested.	Permanent charge on Capital, being 5 per cent. on Addition.	Gross gain on Capital, deducting amounts in F from D.	Increasing the Nominal Horse-power, adds to Capital Invested.	Permanent charge on Capital, being 5 per cent. on Addition.	Gross gain on Capital, deducting amounts in I from D.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	1·00	15·00	..	..	..	..	..	..	..
1½	·81	12·15	2·85	10	·50	2·35	15	·75	2·10
2	·71	10·65	4·35	20	1·00	3·35	30	1·50	2·85
2½	·63	9·45	5·55	30	1·50	4·05	45	2·25	3·30
3	·57	8·55	6·45	40	2·00	4·45	60	3·00	3·45
A	B	C	D	E	F	G	H	I	J

TABLE XIV.

Table showing the Increased Dividend by a Saving in Coal from Expansive Working, the extra Cost of Larger Engines being taken into account; Boilers, Wheels, or Screw, and Indicated Horse-Power being supposed to remain the same.

Proportional Nominal Horse-Power, or Size of Engines.	Proportional Cost of Coal for same actual Power.	ANNUAL COST OF COALS TAKEN AT 25 PER CENT. OF CAPITAL.				
		Cost of Coal in per centage of original Capital.	Saving in Cost of Coal in per centage of original Capital.	Cost of Engines alone (exclusive of Boilers, Screw, &c.), equal to 15 per cent. of Capital, (as in Australian Vessels, Class 4.)		
				Increasing the Nominal Horse-power, adds to Capital Invested.	Permanent Charge on Capital, being 5 per cent. on Addition.	Gross gain on Capital, deducting the amounts in F. from D.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	1·00	25·00	..	..	..	..
1½	·81	20·25	4·75	7·50	·37	4·38
2	·71	17·75	7·25	15·00	·75	6·50
2½	·63	15·75	9·25	22·50	1·12	8·13
3	·57	14·25	10·75	30·00	1·50	9·25
A	B	C	D	E	F	G

It is evident that the dearer the coal is, or the larger the quantity consumed in proportion to the actual power developed, the more advantageous would be the saving effected by expansive working, as the per-centage of saving in coal would the sooner cover any extra cost of engines; and the foregoing Tables clearly show that if the size of the engines be *increased* to *three* times for expansive working, and their *cost* be consequently *doubled, there yet remains a gain*, under the worst circumstances, of ·15 per cent. on capital, and

[redacted]

under favourable circumstances, such as those presented by the Australian vessels, of 9¼ per cent. on capital.*

It is proposed now to consider the effect of increasing the size of the engines for expansive working, as regards the *total weights* carried; and the following Table XV. gives the relative increase of weight resulting from an ordinary engine being increased in size from 1 to 1½, 2, 2½, and 3 times; also the proportionate quantity of coal consumed in a given time; the saving in weight of coal balancing the increase in weight of engines, where the proportion of coal is large. The two last columns give the ratios of time, and the proportionate number of days the coal would last in the respective cases, if the gross weights carried were kept the same.

(*To be continued.*)

REGISTRATION OF INVENTIONS IN NEW SOUTH WALES.

The following is an Act to authorize the Governor-General of Australia to grant Letters of Registration for all Inventions and Improvements in the Arts or Manufactures (to have the same effect in that colony as Letters Patent have in England), which passed the Legislative Council on the fourteenth of September, 1853, and received the Royal assent in December of the same year.

"Whereas it is expedient that the exclusive benefit of inventions and improvements in the arts or manufactures should be secured for limited periods to the author or authors, or designer or designers thereof, or to his or their agents or assignees: And whereas it is doubtful whether the laws of the United Kingdom respecting patents extend to, or have effect in, the colony of New South Wales: Be it therefore enacted by his Excellency the Governor of New South Wales, with the advice and consent of the Legislative Council thereof, as follows:

"I. From and after the passing of this act it shall and may be lawful for his Excellency the Governor of the said colony, with the advice of his Executive Council, to grant letters of registration under his sign manual, and the seal of the colony, for the exclusive enjoyment and advantage for a period of not less than seven nor more than fourteen years, for all inventions or improvements in the arts or manufactures to the author or authors, or designer or designers thereof, or to his or their agents or assignees, as soon as such proceedings shall have been taken by such author or authors, or designer or designers respectively, as are in that behalf hereinafter mentioned.

"II. Every person who upon claiming to be the author or designer, by his agent or assignee, of any invention in, or improvement to, the arts or manufactures, shall be desirous of obtaining such a letter of registration as is hereinbefore mentioned, shall deposit with the Colonial Treasurer the sum of £20 sterling, and shall after such deposit present a petition to his Excellency the Governor, setting forth that he is the author or designer, or the agent or assignee of such author or designer, as the case may be, of a certain invention in, or improvement to, the arts or manufactures, and specifying the particulars of such invention or improvement, and that he has deposited with the Colonial Treasurer the sum of £20 for defraying the expense of granting the letters of registration required by this Act, it shall be lawful for the said Governor for the time being to refer the said petition to one or more competent person or persons, to be appointed by the said Governor, to examine and consider the matters stated in such petition, and to report thereon for the information of his Excellency; and if the report of the person or persons to whom the said petition shall have been referred by the Governor shall be favourable to its prayer it shall be lawful for his Excellency, with the advice of his Executive Council, to grant the letters of registration hereinbefore mentioned; and such letter of registration shall, within three days after the granting thereof be registered in the proper office, in the Supreme Court, otherwise, such letter of registration shall be void and of no effect.

"III. Every grantee of such letter of registration shall be at liberty to assign the same, and all the benefits and advantages derivable therefrom, to any person or persons by an instrument in writing, under his hand and seal, to be registered in the Su-

* It has not been considered necessary to include more than the five classes of vessels in the foregoing Tables, although many other classes exist, in which the proportionate cost of coal and machinery vary from the amounts given. In order, however, to ascertain what advantages would be gained by the substitution of larger engines in any specific case, it will only be necessary to substitute the correct amounts in place of those given above.

preme Court, in the same manner and within the same period after the execution thereof, as the original letters of registration are hereinbefore directed to be registered.

"IV. No grantee of any such letter of registration shall be liable in respect thereof, for any higher charge than the said sum of £20, except for such costs and charges as he shall voluntarily incur, after the deposit of the said sum of £20 with the Colonial Treasurer, as hereinbefore mentioned.

"V. Any letter of registration, granted by virtue of this Act, shall be liable to be repealed by writ of *scire facias* for the same causes and in the same manner, as other grants of the Crown are liable to be repealed.

"VI. That this Act shall come into operation so soon as and not until the same shall have received the Royal approbation, and the notification of such approbation shall have been made by order of his Excellency the Governor-General in the *New South Wales Government Gazette*, and that such notification shall be sufficient evidence of such approbation."

ON STEAM BOILER EXPLOSIONS,

AND THE MEANS OF PREVENTING THEM.

Addressed to His Excellency the French Minister of Agriculture, Commerce, and Public Works.

BY M. ANDRAUD.

PERMIT me, Sir, to call your attention, and that of the eminent men who compose the Steam Engine Commission, to a series of experiments and observations that I have been led to make for the last fifteen years, with a view of studying the causes which produce steam boiler explosions—causes which appear to me to be hitherto completely unknown.

From the nature of the labours I have undertaken, in which I have often been aided by your department, I have had frequent occasion to compress air, from the lowest up to the highest pressures.

Now I have, in the first place, been struck by this fact, viz., that well constructed metallic vessels are never exploded by the slow and regular action of fluid pressure. When that progressive pressure arrives at the limit of the resistance of the vessel, the metal is rent, and the fluid escapes with a whistling sound. I have thus condensed air up to 40 atmospheres before arriving at this rending without explosion, in vessels of 15·7 ins. in diameter, formed of metal of not more than $\frac{1}{25}$ inch in thickness. But when I have desired to produce an explosion, I have been enabled to do so only by instantaneously increasing the pressure from 20 to 200 atmospheres. This I have effected by means of an apparatus which I designed for the purpose, called *Le Levier des Forces Fluides*. This apparatus is such that the condensed air, passing into cylinders of different diameters, reacts on itself, and multiplies its force in any desired proportion, and that at once.

From what precedes, I have been induced to form the conviction that if steam boilers explode, it is not to a slight increase of the normal and regular fluid pressure that the circumstance is to be attributed, but to the sudden intervention of a foreign force, which augments the pressure instantaneously from a few atmospheres to several hundred atmospheres.

This being well understood, I was not long in seeking to ascertain what this foreign force, which plays so fatal a part in the phenomena of explosions, could be.

For a hundred reasons, all of which agree, this foreign force can be no other than that of ELECTRICITY, which is formed in the steam, and which, in certain circumstances, arrives at a state of explosibility.

Now, that electricity is formed in steam, no one at present doubts. Some twenty years ago, a workman having to place a screw in a tube from which steam was escaping, on plunging in his hand felt a violent electric shock. The impulse was given. Accident thus opened the way to a series of experiments which evidently established the fact that there is always formed in boilers, in the midst of the steam a quantity of electricity more or less considerable.* MM. Séguier, Pouillet, Despretz, and twenty other philosophers, both in France and in England, have superabundantly demonstrated it; M. Becquerel has even calculated at what degree of heat steam produces the maximum quantity of electricity.

Now, (and this of the first importance) it is at temperatures corresponding to the lowest pressures that the maximum of electricity is produced, and, by a truly remarkable coincidence, explosions have always taken place when the steam has been at a low pressure. It is extremely rare that a locomotive explodes with violence. It sometimes hap-

* There is a very simple method of showing that a steam boiler contains electricity—that is, by insulating it; that is to say, placing it on glass supports. Deprived thus of all communication with the common reservoir, it spontaneously emits torrents of electric flames, and produces the effect of a strong machine powerfully charged. This curious experiment was first made in England a dozen years ago; it has been since repeated in France with complete success, but without suggesting its connection with the phenomena of explosions.

[redacted]

pens that a few tubes are rent by an excess of pressure, but the disorders which follow explosions, properly so called, do not result from this; and if an example of the explosion of a locomotive should be adduced, it would be found that at the moment of explosion, the boiler contained steam of a low pressure. All these things agree, therefore, in showing that electricity formed in the body of the steam, and led, in certain circumstances, to a state of explosibility, is the sole cause of those explosions by which boilers are shattered.

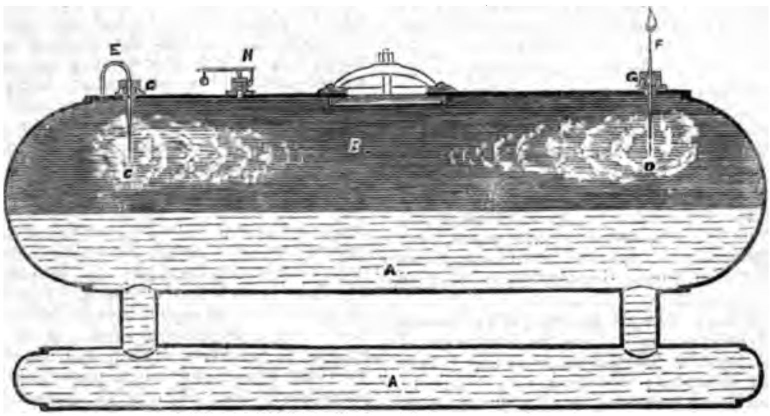
Now, what are the circumstances in which electricity is formed in an explosive state? If these were known, all danger might be avoided by preventing their occurrence; but they are completely unknown. As for myself, if I judge of them by certain indications with which I have become acquainted in the course of the experiments I have made on heated air as a source of motive power, I am led to believe that the electric fluid becomes explosive when the confined steam is in contact with surfaces composed of metals of different natures. In this case there are formed in the boiler two masses of contrary electricity, the one vitreous, the other resinous. These masses are like two clouds which, coming into contact, produce an explosion: it is the phenomenon of thunder produced in a limited firmament, but with a violence increased by the very condensed medium in which it occurs.

On this hypothesis, therefore, in order to prevent explosions, it will be sufficient to take care that the sides of the boiler present to the steam a single metal only; but, I repeat, this is merely an opinion without proof. I hold the hypothesis as very plausible, but I am not convinced of it. I am, however, perfectly certain that the electricity contained in the steam is the sole cause of explosions.

Under these circumstances, and whatever may be the cause which conducts the electricity to a state of explosibility, can nothing be done to prevent explosions?

A very simple thing may be done. As the case resembles that of thunder, recourse may be had to the lightning-rod; and all we have to do is to place in the boiler one or more points of inoxydable metal, which will lead the electricity in proportion as it is formed to the outside, where it will be diffused in the common reservoir. Thus would Franklin's marvellous invention receive its best and most salutary application.

I have attempted to express my views by the accompanying drawing, which represents the section of a steam boiler of the form most subject to explosions.*



A is the mass of water in a state of ebullition.

B is the space occupied by the steam.

C and D are two cloud-like masses of electric fluid of contrary natures, which attract each other, and the contact of which produces an explosion, reproducing very simply the phenomenon of thunder.

E and F are two metallic rods covered with glass, which project into the boiler, and the inoxydable points of which lead off the electricity, after the manner of a lightning-rod. One of these rods would suffice. (It may be remarked, that if the rod terminated also at the exterior in a point, as at

* Boilers of cylindrical form explode more frequently than others, because, owing to their form, they are more insulated, in consequence of which the electricity does not escape with sufficient rapidity. The large boilers on board war-steamers very seldom explode, because they are connected to the sides of the vessels by numerous stays, which act as conductors.

F, a flame might sometimes be seen to rise from it, particularly in the dark.)

H is the ordinary safety-valve, which it is always necessary to preserve, in order to ensure the boiler against rents from excess of pressure.

To resume:

1. Boilers are never exploded by the slow increase of the normal tension of the steam; and safety-valves, which are useful in preventing excess of pressure, and the ordinary harmless effects which result from this, are absolutely useless in preventing explosions.

2. Explosions are produced by the disengagement, in the steam, of an electric fluid, which is brought, in certain circumstances, to an explosive state, and by its discharge increases the pressure suddenly to several hundred atmospheres.

3. There is no serious danger in being near an engine which works at a high pressure.

4. There is always danger of accidents of a fatal character in being near a boiler containing steam of a low pressure, especially when they are of a cylindrical form.*

5. The electric fluid will probably be prevented from acquiring an explosive character, if care be taken to construct the boiler of a single metal only.

6. In all cases, explosions would be avoided, if the principle of the lightning rod were carried out, by the introduction into the interior of boilers of rods terminating in points of inoxydable metal, which will conduct the electricity away as it is formed.

Such, Sir, are the conclusions which I have thought it right to draw from the researches I have submitted to Your Excellency.

I venture to hope that, in consideration of the importance of the question which forms the subject of the present paper, Your Excellency will have the goodness to direct the Steam Engine Commission to examine my suggestions.

If these views are approved of by them, it will be easy to insist upon the general use of the *appareil electro-soustracteurs*, as I have just indicated; doubtless they would be considered beneficial by all who use steam for industrial purposes.

* Very low-pressure boilers present no danger, because the electricity never reaches an explosive state in them.

THE LONG RANGE AND VERTICAL FIRE.

To the Editor of the Mechanics' Magazine.

Sir,—You are doubtless well aware that our improvements and discoveries depend more on our perseverance and the exercise of common sense than on theories; and that the antiquated notions which are inseparably connected with the latter, tend more to retard than to aid the progress of practical science. It is a fact well known to practical men, that the angle for the greatest range is 45°, and that shells, when thrown at this angle, drop vertically on approaching the horizon. Yet this fact is not recognized by our mathematicians, and they still obstinately maintain and propagate in their works on projectiles, that "when a body is projected obliquely upwards," say "at an angle of 45°, its descent is not towards the earth's centre, but inclined to the earth's surface *at the same angle it was projected*." Is it not too bad that such a doctrine should be taught to the officers of our artillery? This most unaccountable idea that bodies projected, move in curves, and drop at the same angle, is maintained also in Herschel's Outlines of Astronomy. See Hopkins' Geology and Magnetism, 2nd edition, page 176. I should like to know the opinion of some of your correspondents on this apparent misconception.

I am, Sir, yours, &c.,
A Civil Engineer.

London, July 24, 1855.

[We subjoin the passage of Mr. Hopkins' work, referred to by our correspondent.]

"When a ball is discharged, it is not the mere resistance of the air and the earth's attraction that reduces the velocity and brings it into a state of rest; it is the *evanescent quality* of that power which had put it in motion: the resisting medium and the attraction of the earth only *diminish the extent* of its path. According to the doctrine of gravitation, neither the radial attraction of the planets, nor a resisting medium, has any influence on the impulsive effect: on the contrary, it is made both *continuous and uniform*, an effect totally inconsistent with the known principles of physics. Had such a doctrine of the laws of motion been founded on correct data, we should have no difficulty in effecting a perpetual motion. What an amount of ingenuity, labour, and expense have been thrown away on the pursuit of the perpetual motion, which might have been turned to better use, if the simplest laws of terrestrial physics had been consulted instead of mere geometry; that is, that no motion can take place and continue without the presence of an active principle!" * *

"The following extract from a standard work on astronomy, written by one of the first philosophers of the day, will at once show on what foundation the orbital motions of the 'Principia' are based, and how geometrical curves and the paths of projectiles have been confounded.

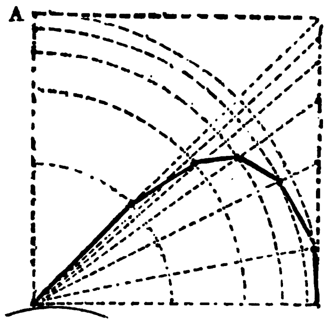
"'All bodies with which we are ac-

[redacted]

quainted, when raised into the air and quietly abandoned, descend to the earth's surface in lines perpendicular to it. They are therefore urged thereto by a force or effort, which we term *gravity*, and whose tendency or direction, as universal experience teaches, is towards the earth's centre; or rather, to speak strictly, with reference to its spheroidal figure, perpendicular to the surface of still water. But if we cast a body obliquely into the air, this tendency, though not extinguished or diminished, is materially modified in its ultimate effect. The upward impetus we give the stone is, it is true, after a time destroyed, and a downward one communicated to it, which ultimately brings it to the surface, where it is opposed in its further progress and brought to rest. But all the while it has been continually deflected or bent aside from its rectilinear progress, and made to describe a curved line concave to the earth's centre, and having a *highest point*, *vertex*, or *apogee*, just as the moon has in its orbit, where the direction of its motion is perpendicular to the radius. When the stone which we fling obliquely upwards meets and is stopped in its descent by the earth's surface, its motion is not towards the centre, but inclined to the earth's radius *at the same angle as when it quitted our hand*. As we are sure that, if not stopped by the resistance of the earth, it would continue to descend, and that *obliquely*, what presumption, we may ask, is there that it would ever reach the centre, to which its motion, in no part of its visible course, was ever directed?

" 'What reason have we to believe that it might not rather circulate round it, as the moon does round the earth, returning again to the point it set out from, after completing an elliptic orbit, of which the centre occupies the lower focus? And if so, is it not reasonable to imagine that the same force deflects the *moon* at every instant from the tangent of her orbit, and keeps her in the elliptic path, &c.? . . . . It is on such an argument that Newton is understood to have rested his law of gravitation.'*

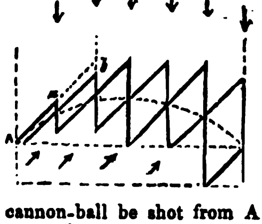
"If a body thrown up at a certain angle, say 45°, will descend again at an angle of 45°, it follows that if thrown sufficiently high it would escape the earth altogether, and possibly revolve round it: but what is the *fact?* It is, that bodies *do not* return at the *same angle*. Suppose a stone was thrown up at an angle of 45° with a force which would carry it to an elevation of 500 yards, it would on its near approach to the earth descend almost *perpendicular*. It commences with its maximum angular force, which exceeds that of the radial attraction of the earth proportionably to the sides of the parellelogram of which its path is a compound; at its greatest elevation the radial attraction and the impulsive force are in a state of equilibrium; as the latter rapidly decays, the former being constant and accumulating, the stone returns, and the angular or tangential force becomes evanescent, until at length the stone is left to the sole action of the radial attraction of the earth, and therefore must proceed towards the centre. Those who may not feel disposed to prove the above mathematically, or who may prefer having an ocular demonstration of the fact, may have an illustration in the path of a stream of water forced by a strong pump at a given angle, when it will be observed



that the curve of the stream of water, instead of forming the same angle at each extremity, will be very different. The impulsive force will be exhausted at A and B.

"To suppose that the moon is retained in a circular path round the earth by a *projectile force*, is contrary to analogy, and cannot be demonstrated.

"The parallelograms commonly described of the composition of the projectile and gravitating forces, are very erroneous; and it is somewhat surprising that they have not been long ere this corrected. A projectile force can neither be constant in direction nor uniform in velocity throughout the curve described. According to the *theory of projectiles* taught in schools, it is supposed that



'if a cannon-ball be shot from A in the direction A *b* (described above), and its original velocity be such as would carry it through the space A *a* during one second,

* Herschel's "Astronomy."

then, if not subject to gravity, it would proceed in a straight line and arrive at *a* in one second, at *b* in two seconds, and so on. Gravity would cause it, during the first second, to fall sixteen feet, and by completing the parallelograms the following arc is described,' and by means of such assumptions, it is supposed 'that the ball moves in a curve and falls in the same angle as projected.'

"In the above parallelogram we can readily admit the parallelism in the vertical action of gravity, within the range of a cannon-ball, but we cannot conceive how a force emanating from the cannon's mouth, fixed to one point, and only capable of imparting that force at that point, could act in the oblique parallel lines shown in the figure. In the vertical direction we find the space described by the ball gradually diminished, until at length the upward force is exhausted, and the ball brought back solely by gravity. Why should the projectile force be constant and uniform at an angle of 45°?"

LIEUT.-COLONEL PARLBY ON THE FLIGHT OF PROJECTILES.

To the Editor of the Mechanics' Magazine.

SIR,—In my last paper, the resistance of the air to the range of projectiles was alone alluded to; but there is also the effect of the constant power of what is termed gravitation to be considered. However, as gravitation acts only in one direction, causing the fall of all projected bodies, of whatever shape they may be, downwards, in a direction coinciding with the perpendicular plane of range, and having no tendency to deflect the body to the right or to the left; and as it is a constant force, well known and undisputed by all mechanical writers, producing motion through so many feet in every second of time of the projectile's flight below the line of horizontal projection, and as it is allowed for in practice by giving increased elevation to the axis of cannon and small arms as the distance to which the projectile to be thrown increases, there is no occasion to dilate upon this subject.

The great object to accomplish in the range of a cannon shot or bullet is, to prevent its being deflected to either side of the true perpendicular plane coinciding with the axis of the bore of the barrel and the point aimed at; and to make the range and the momentum of the projectile as great as possible. It was proved by the experiments of the celebrated Benjamin Robins, more than 120 years ago, that the spherical shape was the cause of the uncertainty of the range of bullets and cannon shot; yet nations have *gone on* to the present day using round balls!

Dr. Hutton found, in his numerous experiments with the ballistic pendulum, at Woolwich, at the end of the last century—although every precaution was used in the perfection of the shot and piece of ordnance, and the utmost care in weighing the charge and loading—that he could never depend upon hitting the pendulum in the proper place when the ranges exceeded 300 yards: and both these eminent men recommended the use of shot having an elongated axis. Experiments have accordingly been made in India, England, and various other nations, with oblong shot of various forms; but no satisfactory result has been produced to satisfy the practical artillerist of the present day, and many, consequently, consider the spherical form as the best.

How is this? Surely the question is easily answered:—a proper form of shot has not yet been found out. Hence, we have resorted to the rifling of barrels in various forms, and even to the monstrous mistake of the rifling cannon of large calibre, which must end in disappointment and failure;* for it is a well-known fact, proved by the ballistic experiments, that even a round ball, perfectly true, and well fitted to a smooth barrel, is discharged with greater velocity than one from a rifle barrel, with the same charge of powder; and the greater velocity will give the greatest range; therefore, on this essential point, that of extent of range. the smooth has the advantage over the rifled one.

A writer in ths *Morning Post*, of the 24th ultimo, Dr. Scoffern, who I believe to be a very clever chemist, alluding to Mr. Whitworth's experimental trials at Manchester, states: "Mr. Whitworth should be aware that the non-rifled gun, even if it could possibly be made of one undeviating cylindrical bore throughout, must ever remain an erratic weapon." What the Doctor means by making the stationary barrel an erratic weapon, I do not understand; surely it is the shot that is discharged from it that deviates from its true path, which may be called the erratic weapon; and it is, therefore, to the shape of the shot that we must confine our attention to overcome the difficulty.

The natural medium through which the projectile has to move, as well as the circumstances attending upon its flight, I have already alluded to in my first paper. It is evident that the resistance of the air, and its friction upon the surface of the projectile, are circumstances of the utmost consequence.

Now, what do we observe in the great and truthful lessons which nature teaches us?

* I shall allude to rifle barrels in my next.

[redacted]

Examine the formation of the birds of the swiftest flight, and the fishes of the most rapid courses; all have sharp terminations in their after parts—the tail feathers and the wing feathers, and the tail fins of fish, all terminate with sharp edges; and the posterior forms of their bodies slope gracefully and easily towards these sharp terminations, and thus the one passes through the highly elastic atmosphere, and the other through the denser and unelastic fluid of water, with the greatest ease and the least possible disturbance of the particles of fluid through which they pass. Now, here is a lesson which no one can dispute, taught by a Being of infinite wisdom; and let us inquire how this can be applied to the form of a projectile to obtain the advantages we require.

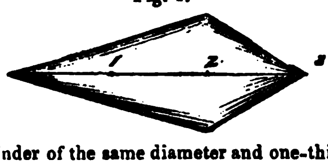
I will state my own ideas upon the subject, and let other ingenious men improve upon them.

We require in a projectile—a solid mass to give force and momentum:—penetration is also of great consequence.

To give ease in passing through the air, I begin with a central point or pole, and as a straight line is the shortest distance between two points, I therefore choose a conical form, with the apex forwards, as the front of my shot, that giving the least surface, (for the space I require to give solidity) for the friction of the air to act upon:—and upon exactly the same rule, I make the termination of my shot a cone also; but I give that increased length, and consequently an increase of surface, because this will have a tendency to preserve the projectile in its course through the air, with its longest diameter coinciding with the line of range and to preserve the leading point of the projectile in its proper position.

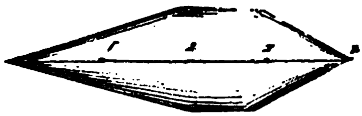
The shape of my shot, therefore, is that of two cones attached to each other by their bases, as in fig. 1, and as a cone is equal to a

Fig. 1.



cylinder of the same diameter and one-third of its height, I have a mass in the double cone far superior to that of a round shot of the same diameter; and, therefore, having greater momentum than a round shot, and being of a form most easily and perfectly produced either in turning or moulding:—and if I desire to make it hollow for a shell or exploding shot, I have greater capacity in the same diameter, than with a spherical body—and if I wish to extend the capacity I have only to add a cylindrical part between the two cones, as in fig. 2.

Fig. 2.

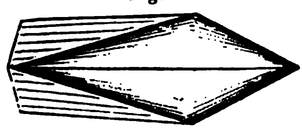


We have now to consider the position of the centre of gravity in these shot, a circumstance of considerable importance when a horizontal range is required—but not so important with shells discharged from mortars at high elevations where the centre of gravity being in the foremost part of the shot would rather be an advantage.

To produce the best horizontal ranges, on those at low elevations, the centre of gravity should be as nearly as possible in the centre of the projectile. I propose, therefore, to cast the large shot with a hollow towards the fore part in such proportion as to bring the centre of gravity as near as possible equally distant from the two extreme points or apexes of the cones. This hollow may always be filled with explosive composition and adapted to a proper time fuze, so as to render all shot doubly destructive, and useless to an enemy.* I have also another mode of correcting the centre of gravity which I cannot now explain.

As the friction of the air upon the surface of the projectile is very great, it is highly important, for correctness of range, that the surface should be as smooth as possible, and the form without defect; but as this can hardly be expected in perfection, any more than the true position of the centre of gravity can be secured, I cause my shot to revolve in the air during its flight by attaching to the posterior sloping sides, two or more projecting wings, forming a very slight angle of ¼ of a degree with the axis of the missile, thus giving it all the advantage, and the only advantage, that a ball from a rifle barrel receives. Thus the shot is completed, as in fig. 3.

Fig. 3.



In my next I shall show the shape of a proper bottom to be applied to this shot, so

* In one of the Duke of Wellington's despatches, it is stated that in one of the French sieges in the Peninsula, the French artillery being without shot, made use of that fired at them by the besieged.

as to give the best effect to the projectile power of the gunpowder, as well as to secure other very important advantages.

I am, Sir, yours, &c.,
SAMUEL PARLBY.

ON THE FLIGHT OF PROJECTILES.

To the Editor of the Mechanics' Magazine.

SIR,—Having never studied any of the current works on gunnery, I am greatly astonished that the theory should have been admitted by high authorities, which Lieut.-Col. Parlby corrects in your last number, viz., that a vacuum exists behind projectiles after a certain velocity. Of what can these learned men have been thinking? Of a flight through a tube? Assuredly did a ball fly through a tube open at both ends, at a speed greater than is due to air rushing into a vacuum, there must remain a vacuum behind it, provided there is a close packing round the ball, to prevent the smallest leakage of the air, condensed to many atmospheres before it, into the section of the tube behind it. But what has this to do with the actual flight of a projectile? Where is the analogy? What has become of the atmosphere "above, below, around?" Under what mandate of *science* does it stand like a wall on the right hand and on the left whilst the children of the artillery are passing through? Is not the air a fluid pressing equally in every direction? What hinders it from closing up, from all sides in a direction at right angles to the line of flight? Even at a mathematical point behind the centre of a ball one inch in diameter, a vacuum could by no possibility exist longer than 1-32,000th part of a second, about the time required for air at the theoretical velocity to rush half an inch—the ball's semi-diameter. Truly these things are startling; upon such a theory, the faster a ball flew the slower it would go. Imagine a dead weight of 14 lbs. or 15 lbs. per inch of the section of a projectile constantly dragging it backwards. That the air *does* close up instantly behind a projectile at any velocity, rushing to a common centre, and causing the whistling by the concussion, I cannot see the slightest reason to doubt. I often encounter some extraordinary discrepancy between scientific teaching and practical fact, and surely this seems a powerful instance. I may be wrong; if great men make mistakes, much more may little men; but it is an undeniable truth, that nothing more hinders the progress of what is called science into the realm of practical utility, than its own inaccuracy. When it occurs to practical men, on taking up some assumed law of science, backed by high authority and testing it by experience, that it fails entirely, can we wonder at the scientific men complaining they are not listened to, or at the complaints which follow when they have been listened to? When, where, and how was the experiment ever made, which Col. Parlby rightly marks in italics, showing not only the existence of a vacuum in the open air, but a diminution of resistance from this dead weight being complete? There is a strange theory of projectiles in Tomlinson's "Rudimentary Mechanics," Weale's series. Why not try another problem? Given the velocity with which water rushes into the air under a vertical pressure of 30 feet, to find the velocity of a ship required to leave such a vacuum (of water) at the stern, that the screw may revolve in the air.

I am, Sir, yours, &c.,
DAVID MUSHET.

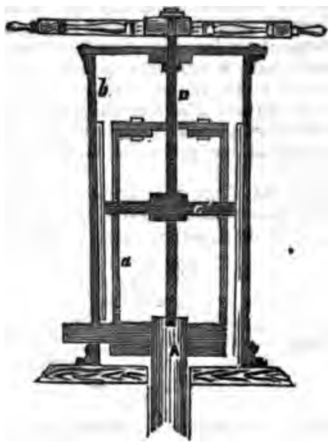
July 31, 1855.

APPARATUS FOR STEERING SHIPS.

To the Editor of the Mechanics' Magazine.

SIR,—Permit me to present to you a sketch of a steering apparatus which I think to be much simpler than any I have yet seen. The accompanying figures will need little explanation. *a*, fig. 1, is a cast-iron

Fig. 1.



cylinder, keyed on the rudder-head, A, and having two oblique grooves for the ends of the cross-head, *c*, to pass through. *b* is a cylinder of boiler plate with a slide on each side to receive the ends of the cross-head, *c*. D is a screw on the top of which is the wheel; the bottom of it rests on the rudder-head, and at the same time forms a

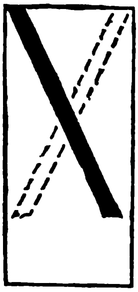
[redacted]

step for the screw. It will be obvious, that if the outer cylinder, *b*, is fixed to the deck of the vessel, and the inner cylinder allowed

Fig. 2.

to move with the rudder, as the wheel is turned either way, it will cause the cross-head, *c*, to rise or fall, and so move the helm. Fig. 2 is a section taken horizontally

Fig. 3.



through the cylinder; and fig. 3, shows the oblique grooves in the inner cast cylinder.

I am, Sir, yours, &c., W. H.

Liver Iron-Works, Liverpool.

ON THE APPLICATION OF LEATHER TO BEARINGS.

BUNNETT'S PATENT.

To the Editor of the Mechanics' Magazine.

Sir,—It is somewhat remarkable that mechanical men should have been so slow to realize the truth of the well-known proverb, "Nothing like leather!" Albeit, for the bearings of machinery, especially if running at high velocities, leather is the very best material that can be employed, being "more durable and less costly" than metal or any other bearings. In the case of a revolving cutter wheel, travelling at an immense speed, a gun-metal bearing became worn in a few days; being replaced with one of leather, it continued in work for many weeks. Leather has been applied to the axle-boxes of common road carriages, and also to the pulleys of ships' blocks with great advantage, and only requires to be better known to be more extensively and usefully employed.

From a notice at page 91 of your last number, it appears that Messrs. Edwards and Frasi have taken out a patent for the application of leather to the bearings for carriages, axles, and shafts of machinery in general; but these gentlemen are "too late:" the application of leather to these purposes was secured, by patent, to Mr. Bunnett, on the 23rd of January, 1851, as may be seen on reference to page 99 of your 55th volume.

I am, Sir, yours, &c.,

Wm. Baddeley.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Wilson, Thomas, of Birmingham, Warwick, engineer. *An improvement or improvements in the manufacture of bands used in the construction of small arms.* Patent dated January 10, 1855. (No. 61.)

Claim.—Finishing bands used in the construction of small arms by the process of turning or cutting the same by means of certain rotating or stationary cutters or tools and machinery described.

Predaval, Bartholomew, of Great Russell-street, Bedford-square, Middlesex, civil engineer. *Improving the production and manufacture of pulp for the making of paper.* Patent dated January 10, 1855. (No. 62.)

This invention consists in the manufacture of pulp from vegetable fibres such as those of the willow, mulberry, and other trees, &c., by cutting them into pieces of about three inches in length, pounding, bruising, grinding, or triturating them, and then winnowing them so as to separate the parts according to their sizes and relative weights. These processes are effected by means of a machine constructed by the inventor for the purpose.

Henley, William Thomas, of St. John-street-road, London, electric-telegraph engineer and machinist. *Improvements in steam boilers or generators, and in apparatus in connection therewith.* Patent dated January 10, 1855. (No. 63.)

This invention consists in applying to boilers, pipes or water passages of a diamond or lozenge shape in the transverse section, these pipes crossing the internal flue of the boiler in a horizontal, vertical, or oblique direction, connecting the water-spaces surrounding the flue; and in employing a perforated furnace-door, fitted with a slide, for the admission of air.

Booth, Edward, of Gorton, Lancaster, gum-manufacturer. *Certain improvements in the mode and machinery for dressing, starching, and finishing textile and other fabrics and*

materials. Patent dated January 10, 1855. (No. 64.)

This invention consists in a mode of applying dressing or stiffening matters to the backs of fabrics, in which the fabric operated upon is stretched and brought against a sieve-cloth fed by a feed-roller. To prevent the dressing or stiffening matter from penetrating to the face of the fabric when the machine is stopped in consequence of the fabric remaining in contact with the sieve-cloth too long, the inventor applies an arrangement of mechanism in connection with the stopping-handle, by which the fabric is lifted from the face of the sieve-cloth simultaneously with the stopping of the machine.

Fuller, William Coles, of Bucklersbury, Cheapside, London, India-rubber spring manufacturer. *Improvements in the construction and adaptation of India-rubber springs.* Patent dated January 10, 1855. (No. 65.)

This invention mainly consists in certain methods of making suspension springs of India-rubber for carriages, and in covering and protecting them. These springs consist of either a ring, a series of rings, or a continuous cord of India-rubber, stretched over two metal reels or sockets. Before securing the ends of each spring by binding, it is necessary to stretch it (by machines constructed by the inventor for the purpose) to the utmost length at which it will require to be used. The ends should then be firmly secured by a binding of tape, cord, wire, or other suitable material, or in some cases by means of metal plates and screws, and as the action of the spring will be confined to the middle part, the ends will be secured from friction.

Bessemer, Henry, of Queen-street-place, New Cannon-street, Middlesex, engineer. *Improvements in the manufacture of iron and steel.* Patent dated January 10, 1855. (No. 66.)

Claims.—1. The conversion of ingots or small pieces of refined iron into steel by cementation with charcoal or other carbonaceous matters in closed retorts or chambers. 2. The conversion of puddled iron in a dry or powdery state, or in a state of small puddle-balls, into steel by the process of cementation with charcoal or other carbonaceous matters in closed retorts or chambers. 3. The progressive or intermittent movement through retorts or chambers of pieces of iron, mixed with charcoal or other carbonaceous matters during the conversion of such pieces of iron into steel, by the process of cementation. 4. The melting of steel in a reverberatory furnace in which a basin or bath is formed, containing flux or melted vitreous matters for the purpose of covering the steel and protecting it from the injurious action of the atmosphere and vapours of the furnace. 5. The melting of steel in a cupola or blast furnace by the use of charcoal as fuel, the steel having first been heated in a retort or heated chamber, and its surface coated with flux or vitreous matters. 6. The combination by fusion of pig or cast-iron with steel. 7. The fusion of steel in a bath of melted pig or cast iron in a reverberatory furnace. 8. The combination by fusion of pig or cast-iron in a cupola or blast furnace, the steel having been previously heated in a retort or heated chamber, and its surface coated with flux or vitreous matters.

Bessemer, Henry, of Queen-street-place, New Cannon-street, Middlesex. *Improvements in the construction or manufacture of ordnance.* Patent dated January 10, 1855. (No. 67.)

This invention consists—1. In the manufacture of ordnance with outlets or passages to lessen the recoil. 2. In the manufacture of pieces of ordnance by casting or founding the same with a compound metal composed of cast or pig iron and steel, run into suitable moulds.

Lehugeur, Louis Pierre, mechanic, and Michel Uttinger, gentleman, of St. Denis, near Paris. *Improvements applicable to machinery for printing fabrics.* Patent dated January 10, 1855. (No. 68.)

In the printing apparatus of the inventors the colour block or table is covered with a cloth of some airtight and waterproof material, and the required elasticity is imparted to it by means of a collapsible vessel, made of India-rubber or other suitable material, and provided with a counterbalance weight, which collapsible vessel is filled with liquid, and keeps the printing cloth at the required tension. The colour is placed in a trough or reservoir at one end of the cloth, which is supplied with the colour by means of a horizontal brush, which extends across the table, and is worked backwards and forwards from and to the colour trough by means of a lever, so that at each stroke of the lever fresh colour is supplied from the reservoir.

Norton, John, of Dublin, esquire. *Improvements in draining land.* Patent dated January 11, 1855. (No. 71.)

Claim.—A mode of draining land wherein the ordinary or other drain cuts are either partially or completely filled with spherical or rounded clay balls to act as the drainage medium.

Robertson, Alexander, of Upper Holloway, Middlesex, engineer. *A new manufacture of packages for dry goods.* Patent dated January 11, 1855. (No. 72.)

The inventor describes a method of constructing packing cases of thin cylinders of wood furnished with flanged rims of tin.

[redacted]

Hall, Edward, of Dartford, Kent, engineer. *Improvements in the manufacture of gunpowder.* Patent dated January 11, 1855. (No. 73.)

This invention consists in regulating the temperature of incorporating gunpowder-mills by applying artificial heat either to their beds or to the interiors of them.

Oxland, Robert, of Plymouth, Devon, sugar refiner. *Improvements in the manufacture and revivification of animal charcoal.* Patent dated January 11, 1855. (No. 74.)

Claims.—1. Passing heated carbonic acid, or the products of combustion of fuel, amongst bones when manufacturing animal charcoal. 2. The employment of carbonic acid and water to separate lime in the revivification of animal charcoal. 3. Drying or reheating animal charcoal in retorts or apparatus subject to streams of heated carbonic acid or products of combustion of fuel.

Townsend, Elmer, of Massachusetts, United States of America. *New and useful improvements in machinery for sewing cloth, leather, or other material.* (A communication.) Patent dated January 11, 1855. (No. 75.)

This invention includes the combination of a stationary bearer and a spring or its equivalent, with a lifter and feeder, whereby, during the operation of sewing the material and feeding it along, the feeder and lifter accommodate themselves to variations in the thickness of the material sewn, and the feeder is pressed against the material while the lifter is moved downward, and while the feeder is moved so as to move the material.

Wood, James, of Barbican, London, printer. *An improved process for lettering and ornamenting glass, which the inventor terms hyalotypy.* Patent dated January 11, 1855. (No. 76.)

The inventor prints letters or devices on paper, gold-leaf, sheet metal, or other suitable thin material, then cuts them out and attaches them to the back of a piece of glass, and subsequently coats the back of both the glass and the letters or devices with an opaque paint or composition.

Hodgson, Joseph Ray, of Sunderland, carver and gilder. *Improvements in the construction of anchors.* Patent dated January 12, 1855. (No. 82.)

We shall publish an illustrated description of the improved anchor shortly.

Guyard, François Victor, engineer, of Gravelines, French Empire. *Certain improvements in the electro-telegraphic communications.* Patent dated January 12, 1855. (No. 83.)

Claims.—1. Constructing apparatus for effecting electro-telegraphic communications with trains or railways in such manner that the distance from the train to which such communications extend is regulated by adjusting the intensity of the current of electricity. 2. Constructing apparatus for effecting such communications with one or more line wires, either divided into lengths or continuous, in combination with communicators, consisting of two rollers acted upon by springs, and forming contact with the line wire. 3. Constructing apparatus for effecting such communications with a distributor for continually reversing the direction of the current of electricity. 4. Constructing the aforesaid apparatus in combination with a registering apparatus.

Miles, Ezra, of Stoke Hammond, Bucks, civil engineer. *An improved coupling joint or connection for tubing or other purposes.* Patent dated January 12, 1855. (No. 84.)

This invention mainly consists in the employment of a rolling or movable packing of India-rubber, or of any other suitable material, and of a method of fitting and tightening rings of canvas, hemp, flax, or of any vegetable fibre, by immersion in caustic alkali.

Turner, Christopher, of Burnley, Lancaster, weaver. *Certain improvements in power looms for weaving.* Patent dated January 12, 1855. (No. 85.)

These improvements consist—1. In introducing a secondary motion for the purpose of actuating the slay for beating up the cloth by means of a suspended weight or a spring attached to a lever which is worked from the driving pulley. 2. In driving the shuttle from one end of the lathe to the other also by a secondary motion, by means of a spring affixed to each picking rod, and by means of two circular pieces of iron, each provided with a drop or fall therein, which are fixed on the ordinary tappet shaft. 3. In reducing the power at present required for shedding or dividing the warp by placing the tappet shaft at the end of the treddle levers and directly under the healds or harness. 4. In fixing a spring with a stud in an upright position near the centre of the lathe, in connection with the present continuous check strap, or in lieu thereof a finger and rod actuated by the swell and back finger of the slay, so that when the shuttle is impeded or does not operate correctly, the said stud or finger will strike another stud secured to the ordinary weft motion lever, thus throwing off the driving strap which consequently stops the loom. 5. In fixing two small pulleys to the back part of the loom frame, so connected with the driving pulley by a strap that the loom may be stopped in a shorter space of time than at present.

Preston, Francis, of Manchester, machinist. *Improvements in ordnance and in*

projectiles for ordnance and small arms. Patent dated January 12, 1855. (No. 87.)

This invention will be described at length shortly.

BARNINGHAM, WILLIAM, of Salford, Lancaster, iron manufacturer. *Improvements in connecting the rails of railways.* Patent dated January 12, 1855. (No. 88.)

The inventor describes several methods of forming chairs the chief of which consists in making them in two halves. The upper parts of the chair fit between the head and the lower portion of the rail, and bolts passing through the ends of the rails and through the slots in the upper parts of the chair secure the whole firmly together, while the lower parts are treenailed or bolted down to the sleepers in the usual way.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Certain means of devulcanizing India-rubber and other similar gums, or of treating such gums after having been vulcanized.* (A communication.) Patent dated January 12, 1855. (No. 90.)

This invention consists in grinding the vulcanized gums into small pieces or to powder—extracting the sulphur from them by means of chemical agents, such as alkaline leys, soap, and mixtures of alkalis with essential or fixed oils, grease, rosin, &c.—washing, pressing, and drying them—and then treating them with substances that are known to be solvents of the native gums (such as spirits of turpentine, naphtha, bicarburet of sulphur, &c.) under the action of heat.

NEVILL, WILLIAM HENRY, of Llanelly, Carmarthen, copper smelter. *Improvements in the construction of reverberatory furnaces for the collection and condensation of volatile substances.* Patent dated January 13, 1855. (No. 93.)

Claim.—The combined application of blast and collecting or condensing flues or chambers with reverberatory furnaces for the purpose of preventing the escape of useful substances that would otherwise be lost.

GRAHAM, JOHN, of Hartshead Printworks, near Staleybridge, Lancaster, calico printer. *Improvements in fixing certain colours in or upon yarns and textile fabrics.* Patent dated January 13, 1854. (No. 94.)

These improvements consist in applying high pressure steam, or heated water under pressure, or steam mixed with air heated to a high temperature, or certain chemical substances to the fixing of colours.

WARNECKE, GUSTAV, of Frankfort-on-the-Maine, merchant. *Improvements in preserving vegetables and fruit.* Patent dated January 13, 1855. (No. 95.)

This invention "consists in absorbing or extracting albumen, cassein, chlorophyl, and bassorine from vegetables and fruits, by first exposing them to a heated saline vapor or water bath, and then washing them in clear water. They are next dried and pressed, when they may be packed for use."

CLAUDOT, JOSEPH, of Paris, France, architect. *An improved stucco.* Patent dated January 13, 1855. (No. 96.)

Claim.—The composition of a marble coating of greater or less thickness, formed by the laying upon a surface of stone, or plaster of other analogous materials, of successive layers of milk of lime compressed and smoothed and then polished until the hardness and brilliancy of marble are obtained; also, the addition of carbonic acid thrown upon these surfaces, and the mixing of colours with the milk of lime in order to produce coloured marbles, &c.

HAYWARD, EDWARD LAMBERT, of Blackfriars-road, Surrey, manufacturing ironmonger. *Improvements in kitchen ranges.* Patent dated January 13, 1855. (No. 98.)

At that end of the fire-place where the oven is situated the inventor recesses the whole or a portion of the lower part of the cheek, so that the principal part of the products passing from the fire to heat the oven pass over the back of the recessed portion of the cheek, or over one or both sides thereof, down that side of the oven which is next to the fire, thence under the oven, up the other side, and away by the flue. A valve is employed to regulate the heat.

PEARCE, JOHN CHARLES, of the Bowling Iron-works, York, engineer. *Improvements in machinery or apparatus for the manufacture and working of iron and other metals.* Patent dated January 13, 1855. (No. 99.)

Claims.—1. The construction of steam hammers with the steam cylinders placed at the side of and parallel to the hammer block. 2. The construction of pumps for feeding the boilers with the steam cylinders disposed at the sides of the water cylinders. 3. The combination of floats and springs in the construction of drain or discharge valves to prevent the accumulation of water in the steam pipes. 4. An arrangement of double-beat valve in combination with a lever plunger and guard screw, for the purpose of reducing and regulating the steam pressure.

OUTRIDGE, JOSEPH EDLYN, of Constantinople, now at Blackfriars-road, Middlesex. *Improvements in transmitting motive power.* Patent dated January 13, 1855. (No. 100.)

Claim.—A mode of transmitting a rotatory or partially rotatory motion by means of rollers, carried in circular rotatory frames or discs, and acting upon a continuous incline or inclines on the shaft or portion of mechanism to be actuated.

GREENWOOD, JOHN, of Irwell-springs,

[redacted]

near Bacup, Lancashire, Turkey-red dyer. *Certain improvements in sizeing, stiffening, and finishing textile fabrics or materials.* Patent dated January 13, 1855. (No. 101.)

This invention consists—1. In producing a new description of size, from barley flour, for the purpose of sizeing, stiffening, and finishing textile materials. 2. In producing a new description of size of barley flour combined or mixed with chloride of calcium, or chloride of magnesium.

Lark, James Peter, of Nine-elms-lane, Vauxhall, Surrey, foreman to Messrs. Francis, Brothers, cement-manufacturers. *Improvements in effecting the combustion of fuel and the consumption of smoke in steam boiler and other furnaces.* Patent dated January 15, 1855. (No. 105.)

This invention relates to a mode of supplying air to furnaces above the fire-bars, by causing it to pass in numerous streams through a chamber containing ignited fuel. The invention also relates to a mode of supplying a jet or jets of steam behind the furnace-bridge, or at the back end of the furnace, in combination with heated air. Also, to forming the fire-bars in two lengths, the hinder portion being shorter than the front, and the spaces between the hinder portion being wider than those between the front portions.

Riley, George, of Portland-place North, Clapham-road, Surrey. *An improved false bottom for brewers', distillers', and vinegar-makers' mash-tubs.* Patent dated January 15, 1855. (No. 106.)

The inventor constructs false bottoms with longitudinal slits for drainage, in lieu of round holes, the slits being as close together as the strength of the material of which the bottom is made will allow, and as narrow as it is possible in practice to make them.

Haynes, Edward, jun., of Bromley, Middlesex, engineer. *A smoke-consuming furnace.* Patent dated January 15, 1855. (No. 107.)

This invention mainly consists of a hollow grate of a cylindrical or other suitable form divided into two compartments by a flat grate placed across the centre inside. The grate thus divided is to be placed in the furnace or fire-box in a horizontal position, resting upon its periphery, and mounted upon friction rollers or wheel bearings, which admit of its being turned round so that each compartment may be alternately in contact with the heating surface of the boiler, and be respectively supplied with fresh fuel when it is. beneath, so that the smoke from the fresh fuel in the lower, passes through the clear fire in the upper compartment.

Choisnet, Urbain Charles, of Birmingham, Warwick, lamp-maker, and Charles Emile Giajola, of Birmingham, lamp-maker. *Improvements in moderateur lamps.* Patent dated January 16, 1855. (No. 109.)

The inventors describe a modification of the ordinary moderator lamps, and a method of attaching to such lamps a dial, on which the time is indicated by means of fingers actuated by the descending piston.

Adkins, Henry, of Edgbaston, near Birmingham, Warwick, manufacturer. *An improvement or improvements in bleaching or decolorizing oily and fatty bodies.* Patent dated January 16, 1855. (No. 110.)

This invention consists in the removal or destruction of the colouring matters which exist in oily or fatty bodies, as they are found in commerce, by the application of chlorine or chlorine compounds liberated from chlorate of potash or other chlorate, by the use of hydrochloric acid, or other acid or agent capable of decomposing chlorates and evolving chlorine or compounds of chlorine therefrom.

Jackson, George, of Manchester, Lancaster, decorator. *Certain improvements in the construction of tents.* Patent dated January 16, 1855. (No. 112.)

This invention consists in the use in the construction of tents of a central or key block in combination with ridge pieces, side posts, horizontal and diagonal traces, &c., by the use of which all internal supports may be dispensed with.

Simkin, James, of Bolton-le-Moors, Lancaster, gun-maker. *Improvements in rifles and other fire-arms.* Patent dated January 16, 1855. (No. 113.)

These improvements relate—1. To the breech-sight, and consist in raising and lowering it by means of screws. 2. To the sight at the opposite end of the barrel, or point sight, which is furnished with a lateral movement by which the sight can be adjusted either to the right or left of the centre of the barrel, according to the degree of deviation of the projectile from its true or central course. This sight is also furnished with a rising and falling motion similar to the breech sight.

Norton, James Lee, of Holland-street, Blackfriars, Surrey. *Improvements in recovering the wool from fabrics composed of wool or wool in connection with cotton or vegetable substance.* Patent dated January 16, 1855. (No. 114.)

The fabrics to be operated upon are steeped by the inventor in dilute sulphuric acid. His claims are—1. Extracting the dilute acid liquor from the fabrics and then gradually drying them before they are exposed to a high temperature of heated atmospheric air or steam to destroy the vegetable matters. 2. The application of ammoniacal vapour or volatile gas for neu-

tralizing the acid. 3. Washing the fabrics for the purpose of separating the vegetable matter from the wool after they have been subjected to high temperatures whereby the length of staple is improved and the acid is neutralized.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MAJOR, WILLIAM, of Copenhagen, Denmark, engineer. *Improvements in the construction and arrangement of screw propellers.* Application dated January 9, 1855. (No. 59.)

This invention consists in feathering the blades of screw propellers by means of a transverse nut in the interior of the boss, and a screw spindle which may be worked either through the interior of a hollow propeller shaft, or by keying a bevil wheel on to the outer extremity of that shaft.

LAMB, JOHN, machinist, and FRANCIS BEST FAWCETT, carpet manufacturer, of Kidderminster, Worcester. *Improvements in certain parts of the machinery employed in the production of various fabrics in which bobbins are used.* Application dated January 9, 1855. (No. 60.)

This invention has reference to the construction of certain mechanical contrivances to be used in connection with the bobbin weight and frame in machinery for weaving Brussels carpets, and other fabrics in which bobbins are employed, and has for its primary object the securing of such machinery from the derangement and injury to which it is subject from the weights being liable to fall to the ground upon the breaking of a warp thread; and in order to remedy this defect the inventors cause the weight to be secured by suitable means to the frame or creel of the machinery, instead of being detached, as in Wood's, Crossley's, and Prentice's patents.

GEDGE, JOHN, of Wellington-street South, Middlesex. *Improvements in the construction of metallic flooring, supports for floors, walls, or partitions of buildings.* (A communication.) Application dated January 11, 1855. (No. 69.)

The patentee says, "I propose to make my flooring of iron in double T or single T iron and to confine it to the dimensions of its own construction. By the use of such flooring transoms filled with plaster or of plaster itself will be obviated."

HERVÉ, JACQUES LOUIS, of Paris, France, Rue de l'Eperon, householder. *Improvements in preserving meat and fish.* Application dated January 11, 1855. (No. 70.)

This invention consists in extracting the moisture from meat or fish by means of a vacuum, combined with the use of sulphuric acid, or other equivalent for absorbing moisture.

THOMAS, WILLIAM LYNALL, of Anderton, Devon, gentleman. *Improvements in projectiles and gun wads.* Application dated January 11, 1855. (No. 77.)

The inventor says, "I form an elongated conoidal bullet or projectile with a hollow, of a square or other suitable shape, in the tail thereof, and make it smaller in circumference from one-third to one-half of its length. I form my wad of papier maché, or of any other suitable substance, and hollow it out at top. In the centre of this hollow is a plug of the same shape as that in the projectile, the smaller end of which fits into the hollow in the wad, while the plug in the wad fits the aperture in the tail of the projectile; a small space is left between the top of the wad and the shoulder, formed at that part of the projectile where it is diminished in circumference. This space is afterwards filled by the projectile being forced against the wad by the ramrod, or by the wad being forced against the projectile on the discharge of the gun. The bottom of the wad is provided with a conical-shaped hollow plug, which, on the discharge of the gun, is driven into a corresponding but smaller aperture in the bottom or back end of the wad. The wad, on the discharge of the gun, becomes expanded both at top and bottom, and filling the barrel, prevents windage. In order to increase the range of the projectile, I sometimes introduce a charge of percussion powder in the plug. In rifled arms, the wad being forced into the grooves, will communicate rotary motion to the projectile, which need only be rammed into the gun as if the barrel were smooth. When fired from smooth bores, I provide the projectile with spiral wings, and the wad with corresponding grooves, into which the spiral wings fit, by which means a rotary motion will be imparted to the projectile. To keep the forepart of the projectile in the centre of the barrel, so that the axial lines of the two may coincide, I employ an expanding wad, the rear end of which is hollowed out to receive the front of the projectile, a space being left to allow for the expansion of the wad. The wad is formed in two parts, the meeting faces of which are formed with conical hollows, and a double inclined plug is introduced between them, which, when the wad is introduced into the barrel of a fire-arm, is caused to expand both parts of the wad, by a smart blow from the ramrod. The parts of the wad are held together by a strip of paper or other material cemented round them. Where the projectile is in the form of a shell or rocket, I light the fuse through an aperture made in the tail thereof; but then

[redacted]

I dispense with the hollow in the tail of the projectile and plug in the wad, and provide an aperture through the wad to correspond with and communicate fire to the fuse. Instead of the projectile and wad fitting together as above described, they may each be screw threaded."

DAVIDS, SMITH WILLIAM, of Carnarvon, North Wales, slate agent. *Certain improvements in elongating chandeliers and gaseliers.* Application dated January 11, 1855. (No. 78.)

This invention consists in substituting for the water or slide apparatus for raising and lowering chandeliers and gaseliers an arrangement consisting of a coiled flexible tube, attached at one end to the supply pipe, and at the other to the head of the downward slide pipe of the chandelier or gaselier, balance weights being employed as in the ordinary manner.

ONIONS, JOHN, of Wellington-place, Blackfriars-road, Southwark, iron-founder. *Certain improvements in the construction of pipes and tubes for the use of smoking tobacco and cigars.* Application dated January 12, 1855. (No. 80.)

This invention consists in the application of certain tubes, pistons, or plungers to cylindric or other shaped barrels, for the purpose of causing the more effectual combustion of tobacco and cigars during the operation of smoking.

HUNT, WILLIAM, of Tipton, Stafford, chemist. *Improvements in the manufacture of iron.* Application dated January 12, 1855. (No. 81.)

The inventor uses the oxide of iron which occurs as a residuum from burning of sulphuret of iron or pyrites (particularly coaly pyrites), for making iron.

HARRISON, JOSEPH, and JOHN ODDIE, of Blackburn, Lancaster, machinist. *Improvements in machines for sizeing, drying, and otherwise preparing yarns or threads for weaving.* Application dated January 12, 1855. (No. 86.)

This invention mainly consists in substituting for the heat of steam employed in the above processes "heat arising from combustion, or heated air, or the heated products of combustion. The material which we believe," say the inventors, "to be most economical and conveniently applied to effect this purpose is coal or other inflammable gas, which may be burned under or in the interior of the drying cylinders or boxes."

GADOL, PETER NICHOLAS, of Bermondsey, Surrey, tanner. *An improved process to be employed in tanning.* Application dated January 12, 1855. (No. 91.)

In carrying out this invention the hides, after being exposed to the action of lime, are treated with muriatic acid; the superabundant acid is then cleared out of them by treating them with soda, and when thoroughly purified and opened by the above processes they are steeped in a mixture of common salt, potash, and molasses.

BRITTEN, JOHN, of Birmingham, Warwick, engineer. *An improvement or improvements in the means of filtering liquids.* Application dated January 13, 1855. (No. 92.)

This invention "consists in promoting or expediting filtration by the atmospheric pressure produced by a column of the liquid being filtered, the said column being situated below the level of the liquid in the reservoir" !

HOLLINS, MICHAEL DAINTRY, of Stoke-upon-Trent, Stafford, gentleman. *Improvements in slip kilns for drying clay.* Application dated January 13, 1855. (No. 97.)

These improvements consist in constructing slip kilns in such manner that the flues from the fire-place, having arrived at or near the further end of the pan, shall pass back again under the pan, and have another fire-place near the chimney which is erected at that end of the pan at which the first-mentioned fire-place is situated.

BURKE, FRANCIS, gentleman, of Woodlands, Montserrat, British West Indies. *Improvements in and apparatus for obtaining from the plantain, banana, aloe, penguin, and other vegetable substances, fibres applicable to various manufacturing purposes.* Application dated January 15, 1855. (No. 102.)

In carrying out this invention, rotating cylinders furnished with suitable projections for beating the substances under operation are made to work in close proximity to a suitable platform wholly or partially covered with leather.

FROST, WILLIAM TOPLIS, of Shottle, near Belper, Derby, gentleman. *Improvements in machinery for cleaning knives.* Application dated January 15, 1855. (No. 103.)

In applying this invention, the knives to be cleaned are placed between two elastic beds, covered by preference with buff leather. These beds are affixed to slides, and the slides are held together and regulated, as to distance apart, by screws or other means at the ends. A framework contains the sliders, and the knives are held stationary by the framework while the slides are passed backwards and forwards.

OMMANNEY, HENRY MORTLOCK, of Chester, esquire. *An improvement in the manufacture of shot, shells, hollow shot, and other projectiles.* Application dated January 15, 1855. (No. 104.)

The inventor casts shot, shell, &c., as usual, and then places them in an annealing furnace, continuing them there till they become malleable, or partially so.

PROVISIONAL PROTECTIONS.

Dated March 31, 1855.

723. William Henry Balmain, of St. Helens, Lancaster, manufacturing chemist. Improved methods of, or processes for, recovering oxide of manganese after it has been used in the manufacture of chlorine.

Dated May 4, 1855.

997. Jean Pechgris de Frontin, of Agen, France. The use of a new material in the manufacture of paper and pasteboard.

Dated July 9, 1855.

1530. Richard Roberts, of Heaton Norris, Lancaster, machine maker, and George Coppock, of the same place, manager. Certain improvements in looms for weaving.

1531. Henry Edward Flynn, of Retreat, Ranelagh, Dublin. Improvements in preventing fire from the overheating of hot air flues.

1532. John Prophet, of Broughty Ferry, Forfar, confectioner. Improvements in the manufacture or production of confectionery.

1533. James Tetlow, of Oldham, Lancaster, cotton spinner and manufacturer. Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.

1535. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. A new manufacture of fire and burglar-proof glass. A communication.

1536. John and Anton Bruno Seithen, of Regent's-square, Middlesex. Improvements in machinery for cutting and shaping cork.

Dated July 10, 1855.

1539. James Palmer, of Oldham, Lancaster, manager. Improvements in machinery for carding cotton and other fibrous substances.

1541. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved means of securing wheels upon axles. A communication.

1543. Charles James Cheatley Elkinton, of Hall-street, City-road, Middlesex, electro-metallurgical artist. Improvements in depositing alloys of metals.

Dated July 11, 1855.

1544. Henry Pratt, of Worcester, engineer. Certain improvements in steam-flour mills, windmills, and water-mills, parts of which are also applicable to other useful purposes. Partly a communication from Edward Harrison of Connecticut, United States of America.

1545. John Henry Johnson, of Lincoln's Inn-fields, Middlesex, gentleman. Improvements in apparatus or means for facilitating the performance of church and other music on organs, harmoniums, pianos, and other similar keyed musical instruments. A communication from François Guichené.

1546. John Henry Johnson, of Lincoln's Inn-fields, Middlesex, gentleman. Improvements in the permanent way of railways, and in carriages to be used in connection therewith, or on common roads. A communication from Pierre Joseph Bertrand Geoffrey, of Dax, France, manufacturer.

1547. James Hall Nalder, of Alvescott, Oxford, farmer. Improvements in winnowing or dressing grain and seeds.

1548. Joseph Wilson, of Manningham, near Bradford, York, builder. Improvements in means or apparatus for the manufacture of rolling or piece boards used in rolling or wrapping piece goods.

1549. Edmund Hart, of Nottingham, lace manufacturer. Improvements in the manufacture of lace.

1550. John Coulson, of Penzance, Cornwall, merchant. Improvements in apparatus for ventilating mines, which improvements are also applicable to other purposes where ventilation is required.

1551. Julius Jeffreys, of Kingston-hill, Surrey. Improvements in sun blinds or solar screens.

1553. Julius Jeffreys, of Kingston-hill, Surrey. Improvements in steam boilers.

1554. John Adams, of Aldwincle, Northampton, gentleman. Improvements for indicating the time when persons commence and leave their work or calling.

1555. Charles Frederick Bielefeld, of Wellington-street, Strand, papier mâché manufacturer. Improvements in the manufacture of saddle-trees.

1556. William Williams, of Bedford, iron-founder. Improvements in the manufacture of bricks, pipes, and tiles.

Dated July 12, 1855.

1558. John Robinson, of the firm of Sharp, Stewart, and Co., of Manchester, engineers, and William Wedding, of the same place, mechanical draughtsman. Improvements in machinery for cutting paper, card-board, and other materials.

1560. Frederic Howorth Edwards, of Newcastle-upon-Tyne, Northumberland, civil engineer. Improvements in obtaining motive power from fuel, air, and water.

1562. James Caldow and James Bainden Affleck M'Kinnel, of the Palmerstone Iron Works, Dumfries, Kirkcudbright, machinists. Improvements in machinery or apparatus for cutting or reducing vegetable substances.

Dated July 13, 1855.

1566. Joseph Henry Tuck, of Pall-mall, Middlesex, civil engineer. Improvements in apparatus for condensing or exhausting atmospheric air, or other elastic fluids. A communication.

1568. Thomas Redmayne, of Rotherham, York, iron-founder. Improvements in stove-grates.

1570. Samuel Cunliffe Lister, of Bradford, York. Improvements in weaving looped or pile fabrics.

1572. Robert Cochran, of Verreville Pottery, Glasgow. An improvement in the preparation of clay for potters' use.

1574. Eugène Gillett, of Rue des Aperroniers, Bruxelles. Improvements in fixing artificial teeth.

1576. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in pumps. A communication.

1578. Louis Koch, of New York, United States of America, engineer. An improvement in machines for making pulp from wood and vegetable fibrous substances.

1580. Henry Grafton, of Rolls-buildings, Fetter-lane, Middlesex. Improvements in the manufacture of fire-lighters, which are also applicable for other burning purposes.

1582. Charles Lanchester Neale, of Chapel-place, Cavendish-square, London. A new medicinal lotion, to be called the "Crimean Neuralgic Specific."

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1658. James Tildesley, of Willenhall, Stafford, manufacturer. An improvement or improvements in currycombs. July 21, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July* 31*st*, 1855.)

614. Louis Henry Crudner and Frederic Louis Koebrig. An improved apparatus for purposes of ventilation.

[redacted]

615. John Smalley. Improvements in railway-carriage axles.

619. Archibald White. Swinging beds, which will enable soldiers and others to sleep dry in tents or huts, and occasionally in the open air.

621. William Taylor. Improvements in the construction of "pickers" for power-looms.

628. Auguste Edouard Loradoux Bellford. A new and improved governor for engines and machinery. A communication.

631. William Miller. An improved apparatus for the prevention of smoke and promoting ventilation.

646. William Young. Improvements in stoves or fire-places.

650. Robert Joseph Jesty. Improvements in apparatus for indicating between parts of a train of carriages on a railway.

653. T. F. E. Clewe. A new construction of locomotive engines, tenders, and railway carriages.

654. Griffith George Lewis and Joseph Gurney. An improved construction of knapsack, convertible, when required, into a bed, a litter, or a tent.

661. John Britten. A new or improved machine for sweeping or cleaning chimneys.

669. Oliver R. Burnham. Improvements in the construction of projectiles.

685. William Hutchison. Improvements in manufacturing artificial stone, and in giving colour to the same.

691. William Henry Gauntlett. Improvements in apparatus for cutting or pulping turnips and other roots.

694. John Gedge. Improvements in the means of stopping or retarding railway-trains. A communication from Franz Steigerwald Heinrich Schirges and Carl Fuchs, of Munich, Bavaria.

698. James Porritt. Certain improvements in steam-engines.

723. William Henry Balmain. Improved methods of, or processes for, recovering oxide of manganese after it has been used in the manufacture of chlorine.

750. Maximilien Evrard. An improved continuous drawing compresser for moulding or bruising several substances or mixtures.

771. Henry Gerner. Improvements in polygraphic or writing and drawing apparatus.

869. Charles M'Ilvaine Congreve. Improvements in the manufacture of iron when oxide iron ores are used. A communication from Charles Congreve.

929. Auguste Edouard Loradoux Bellford. An improved gas regulator. A communication.

930. Auguste Edouard Loradoux Bellford. Improvements in the manufacture of seamless garments, or other useful articles of felt. A communication.

934. Auguste Edouard Loradoux Bellford. A new and improved lock for sliding-doors. A communication.

976. James Edward Boyd. A "ship's course indicator or exhibitor," for the purpose of exhibiting to the helmsman and others, in a legible manner, the course which a ship is to steer, as well as for certain improvements in ships' compasses."

989. William Basford. Improvements in purifying coal gas, and for obtaining a residium therefrom, which may be used as a pigment or colour, or for other useful purposes.

1016. Johnson Hands. Improvements in boiler and other furnaces and flues.

1023. William Burtt Wilton. Improvements in furnaces for steam engines.

1051. Edwin A. Forbush. An improved machine for sewing leather, cloth, &c.

1144. Alexander Henry Mentha. Certain improvements in the manufacture of wadding, and in the machinery or apparatus connected therewith.

1219. John Whitehead, jun., and Robert Kay Whitehead. Improvements in finishing woven fabrics.

1435. Auguste Edouard Loradoux Bellford. Improvements in screw fastenings. A communication.

1480. Auguste Edouard Loradoux Bellford. Improvements in manufacturing, lighting, and heating gases. A communication.

1503. William Clay. An improved mode of manufacturing forged iron.

1513. Richard Archibald Brooman. Improvements in the manufacture of figured net and other like open fabrics. A communication.

1535. Alfred Vincent Newton. A new manufacture of fire and burglar proof glass. A communication.

1548. Joseph Wilson. Improvements in means or apparatus for the manufacture of rolling or piece boards used in rolling or wrapping piece goods.

1558. John Robinson and William Wedding. Improvements in machinery for cutting paper, card-board, and other materials.

1562. James Caldow and James Bainden Affleck McKinnel. Improvements in machinery or apparatus for cutting or reducing vegetable substances.

1570. Samuel Cunliffe Lister. Improvements in weaving looped or pile fabrics.

1572. Robert Cochran. An improvement in the preparation of clay for potters' use.

1578. Louis Koch. An improvement in machines for making pulp from wood and vegetable fibrous substances.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed July 20, 1855.

173. Frederic Prince.
180. Sir James Caleb Anderson.
184. William Edward Newton.
212. Henry Nightingale and Robert Nightingale.
281. Peter Smith.
322. John Ramsbottom.
378. Benjamin Goodfellow.
452. Stanislas Vigoureux.
651. David Elder, jun.
1060. Edward Humphries and Thomas Humphries.
1088. Thomas Charles Eastwood and Thomas Whitley.
1177. Theodor Baron Von Gilgenheimb.
1236. Alfred Vincent Newton.

Sealed July 24, 1855.

181. Charles William Tupper.
183. Augustus Edward Schmersahl and John Augustus Bouck.
204. George Searby.
207. John Hutchinson.
234. Arthur Lyon.
240. John Francis Porter.
251. Jules Castel and Frederic Maurichean Beaupré.

252. Isidore Carlhian and Isidore Corbière.
261. Thomas Allan.
267. Peter Armand Lecomte de Fontainemoreau.
286. William Warbrick and John Walker.
311. John Langman.
314. George Henry Ingall.
453. Thomas Sadleir.
535. George Tomlinson Bousfield.
587. William Monday the younger.
647. James Willis.
664. John Henry Johnson.
1033. Alfred Vincent Newton.
1068. Adam Guild.
1099. George Tomlinson Bousfield.

Sealed July 27, 1855.

254. Patrick Moir Crane.
269. Ebenezer Hartnall.
293. George Briggs.
317. William Balk.
321. George Rennie.
355. Samuel Barlow Wright and Henry Thomas Green.
415. Hamilton Martin and Joseph Smethurst.
445. Henry Constantine Jennings.
779. William Tuer, William Hodson, Robert Hall, and Samuel Hall.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

A Miner.—The experiments performed at the Polytechnic Institution and elsewhere with the apparatus you refer to induce us to believe that it would answer very satisfactorily for the purpose you mention.

J. A.—The cause of the failure in the launch of the *Marlborough* is not yet stated authoritatively, and is probably the subject of conjecture only.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

[redacted]

Mechanics' Magazine.

No. 1670.] SATURDAY, AUGUST 11, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

ALLEN'S MARINE STEAM ENGINES.

Fig. 2.

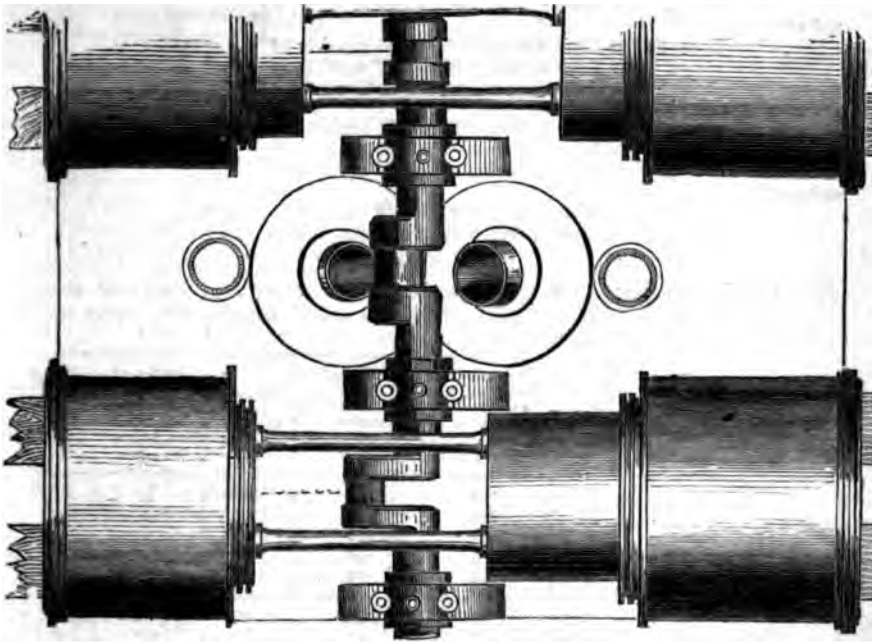
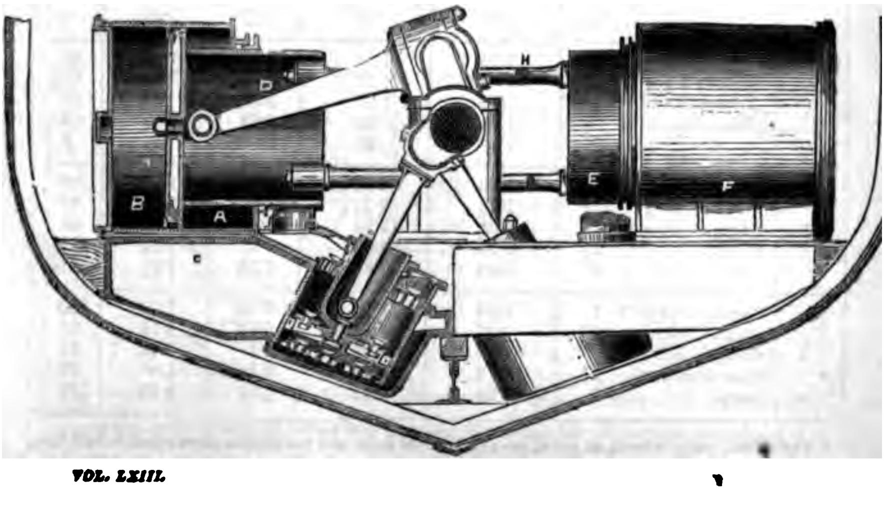


Fig. 1.



ON WORKING STEAM EXPANSIVELY IN MARINE ENGINES.

BY MR. E. ALLEN.

(*Concluded from page 103.*)

The general results may be given as follows; that when the size of the engines is doubled, the gross weights of machinery and coal together are

Increase.
Increased in Class 1, from 1·25 to 1·68 equal to 34 per cent.
„ in Class 2, from 2·00 to 2·21 equal to 10½ „
„ in Class 3, from 2·50 to 2·56 equal to 2½ „

and are Decrease.
Decreased in Class 4, from 5·00 to 4·34 equal to 13 per cent.
„ in Class 5, from 8·00 to 6·47 equal to 19 „

Also, when the size of the engines is increased to 3 times, the gross weights of machinery and coal together are Increase.
Increased in Class 1, from 1·25 to 2·14 equal to 71 per cent.
„ in Class 2, from 2·00 to 2·57 equal to 28½ „
„ in Class 3, from 2·50 to 2·85 equal to 14 „

and are Decrease.
Decreased in Class 4, from 5·00 to 4·28 equal to 14 per cent.
„ in Class 5, from 8·00 to 5·99 equal to 25 „

TABLE XV.

Table showing the Proportionate Weights of Machinery and Coal, and Joint Weights of same, when the Size or Nominal Horse-Power of Engines is varied (Indicated Horse-power supposed the same in all cases respectively).

Class.	Service.	Ratios of Nominal Horse-power.	* Ratios of Weight of Machinery corresponding to Increase of Nominal Horse-power	Ratios of Weight of Coal corresponding to Increase of Nominal Horse-power.	Ratios of Total Weights.	Ratios of Time the Coal would last if the Total Wts. be kept the same.	Ratio in Days.
1	River.	1	1·00	·25	1·25	1	2½
		1½	1·25	·20	1·45	..	..
		2	1·50	·18	1·68	..	..
		2½	1·75	·16	1·91	..	..
		3	2·00	·14	2·14	..	..
2	Coasting and Continental.	1	1·00	1·00	2·00	1·00	10
		1½	1·25	·81	2·06	·92	9
		2	1·50	·71	2·21	·70	7
		2½	1·75	·63	2·38	·39	4
		3	2·00	·57	2·57	·00	0
3	Ocean (Short Voyages) and Government.	1	1·00	1·50	2·50	1·00	15
		1½	1·25	1·21	2·46	1·03	15½
		2	1·50	1·06	2·56	·94	14
		2½	1·75	·94	2·69	·80	12
		3	2·00	·85	2·85	·59	9
4	Ocean (Long Voyages) Australian.	1	1·00	4·00	5·00	1·00	40
		1½	1·25	3·24	4·49	1·15	46
		2	1·50	2·84	4·84	1·23	49
		2½	1·75	2·52	4·27	1·29	51¼
		3	2·00	2·28	4·28	1·31	52½
5	Ocean (Voyages out and home), Eastern Steam Navigation Company.	1	1·00	7·00	8·00	1·00	70
		1½	1·25	5·67	6·92	1·19	83
		2	1·50	4·97	6·47	1·30	91
		2½	1·75	4·41	6·16	1·41	99
		3	2·00	3·99	5·99	1·50	105

* *The boilers, water, wheels, or screw, are supposed the same, and the engines alone equal to half the gross weight of machinery.*

[redacted]

The last columns show that in the 4th Class, where the weight of coal carried is equal to four times the gross weight of machinery, if the size of the engines be doubled, the same gross weight being taken, then the coals will last nine days longer—equal to 22 per cent. increase; and if the size of the engines be increased to three times, and the gross weight carried be kept the same, then the coal will last 12½ days longer—equal to 31 per cent. increase.

Also, in the 5th Class, where the weight of coal carried is equal to seven times the gross weight of machinery, if the size of the engines be doubled, the gross weight being kept the same, then the coal will last 21 days longer—equal to 30 per cent. increase; and if the size of the engines be increased to three times, and the gross weight carried be kept the same, then the coal will last 35 days longer—equal to 50 per cent. increase.

The last part of the subject to be now considered is, the effect which the increase in the size of the engines has upon the *total spaces* occupied by machinery and coals together. Table XVI. gives the results, where the size increases from one to one and a half, two, two and a half, and three times, for the three divisions into which the five classes of vessels, before spoken of, are reduced.

In Class 1 the coals occupy a space *equal* to that occupied by the engines alone; in Classes 2 and 3, *three times*; and in Classes 4 and 5, *five times* the space occupied by the engines alone.

The space above spoken of is horizontal space, taken at the greatest beam of the vessels.

The general results are, that if the size of the engines be doubled, then the total space occupied by machinery and coals taken together (the coals lasting the same time in all cases),

In Class 1, . increases from 4·00 to 4·21, equal to 5 per cent.
In Classes 2 and 3, decreases from 6·00 to 5·63, equal to 6 „
In Classes 4 and 5, decreases from 8·00 to 7·05, equal to 12 „

Also, if the size of the engines be increased three times, then the total space occupied by machinery and coals taken together,

In Class 1, . increases from 4·00 to 4·57, equal to 14 per cent.
In Classes 2 and 3, decreases from 6·00 to 5·71, equal to 5 „
In Classes 4 and 5, decreases from 8·00 to 6·85, equal to 15 „

TABLE XVI.

Table showing the Relative Spaces occupied by Engines, Boilers, and Passages, and Coals, separately and together; the Size or Nominal Horse-Power increasing from 1 *to* 3; *the Actual or Indicated Horse-power remaining the same.*

Class.	Service.	Ratios of Size or Nominal Horse-power.	Ratios of Spaces occupied by Engines alone. *	Spaces occupied by Boilers and Passages (Constant). †	Ratios of Spaces occupied by Coals. ‡	Ratios of Total Spaces.
1	River.	1	1·00	2	1·00	4·00
		1½	1·25	2	·81	4·06
		2	1·50	2	·71	4·21
		2½	1·75	2	·63	4·38
		3	2·00	2	·57	4·57
2 and 3	Coasting and Continental and Ocean (Short Voyages).	1	1·00	2	3·00	6·00
		1½	1·25	2	2·43	5·68
		2	1·50	2	2·13	5·63
		2½	1·75	2	1·89	5·64
		3	2·00	2	1·71	5·71
4 and 5	Ocean (Long Voyages) and Eastern Steam Navigation Company's Vessels.	1	1·00	2	5·00	8·00
		1½	1·25	2	4·05	7·30
		2	1.50	2	3·55	7·05
		2½	1·75	2	3·15	6·90
		3	2·00	2	2·85	6·85

* The actual horizontal space occupied by engines may be taken generally at 3/4 square foot per nominal horse-power.

† The actual space occupied by boilers may be taken at 1 square foot per nominal horse-power, and passages at 1/2 square foot.

‡ See Note on next page.

Table XVII. shows how the *cargo space* is diminished or increased under the three suppositions, that the machinery and coal space is *equal* to the cargo space, or to *two-thirds*, or to *one-half* the cargo space; these proportions embracing the ordinary limits.

TABLE XVII.

Table showing the Per Centage of Loss or Gain in Cargo Space, and the Per Centage of Saving in Quantity of Coals required, when the Size or Nominal Horse-power of the Engines is Increased, the Indicated Horse-power being the same.

Ratios of Total Spaces occupied by Machinery and Coals (from foregoing Table).	The same Ratios, but showing the per centage of Increase or Decrease.	Per Centages in which the Cargo Space is Diminished or Increased.			Ratios of Coals consumed in the same time, and developing the same Power.	Per centage of Coal saved by Expansive Working.
		1st. When the total Machinery and Coal Space is *equal* to the total Cargo Space.	2nd. When the total Machinery and Coal Space is 2/3 of the total Cargo Space.	3rd. When the total Machinery and Coal Space is 1/2 of the total Cargo Space.		
4·00	100	Diminishes Per Cent.	Diminishes Per Cent.	Diminishes Per Cent.	100	Per Cent. ..
4·06	101½	1½	1	¾	81	19
4·21	105	5	3⅓	2½	71	29
4·38	109	9	6	4½	63	37
4·57	114	14	9⅓	7	57	43
6·00	100	Increases Per Cent.	Increases Per Cent.	Increases Per Cent.	100	Per Cent. ..
5·68	94	6	4	3	81	19
5·63	94	6	4	3	71	29
5·64	94	6	4	3	63	37
5·71	95	5	3⅓	2½	57	43
8·00	100	Increases Per Cent.	Increases Per Cent.	Increases Per Cent.	100	Per Cent. ..
7·30	91	9	6	4½	81	19
7·05	88	12	8	6	71	29
6·90	86	14	9⅓	7	63	37
6·85	85	15	10	7½ ‡	57	43

If the engines be doubled in size, then
In Class 1, the cargo space diminishes 5, 3⅓, and 2½ per cent.
In Classes 2 and 3, „ „ increases 6, 4, and 3 „
In Classes 4 and 5, „ „ increases 12, 8, and 6 „
If the engines be increased in size three times, then
In Class 1, the cargo space diminishes 14, 9⅓, and 7 per cent.
In Classes 2 and 3, „ „ increases 5, 3⅓, and 2½ „
In Classes 4 and 5, „ „ increases 15, 10, and 7½ „
The last column gives the per-centage of saving in coal.

The effects of *increasing the size* or nominal horse-power of engines, for the purpose of working the steam more expansively have now been considered, in respect both to the *increased first cost of machinery*, so far at least as the interest on the increased capital is concerned, the *saving of coal* in per-centage of capital, the *increase of weight of machinery*, and the *saving in weight of coal*, and also in respect to the *total spaces occupied by machinery and coal*, as also the effect of the changes on the *cargo space* in per-centage of the first supposed cargo space; and it is considered that the results are such as are not generally known, and that merchants and ship-owners are wholly unaware of the advantages of working steam expansively, even should they be compelled at the outset to pay double the amount now usually paid for engine power.

It would appear certain that if no alternative existed but that of increasing, say the diameter of the cylinders of marine engines, and thus increasing the first cost in about the proportion of 1½ times for double the size and 2 times for 3 times the size, (the boilers,

‡ The space occupied by the coals varies,—Class 1, 3/4 square foot; Classes 2 and 3, 2¼ square feet; *and Classes* 4 and 5, 3¾ square feet per nominal horse-power.
Ratios—Engines, 1; Boilers and Passages, 2; Coals, 1, 3, and 5 respectively.

[redacted]

wheels, or screw being supposed to remain the same), ample reason still exists for making such a change in contracting for engines intended for vessels carrying a large proportion of coal; and it has been shown that if double the ordinary amount be paid for the machinery, yet 9¾ per cent. increase may be paid upon the capital in some cases, after deducting for the extra cost of engines, by the economy in coal alone.

It has also been shown that notwithstanding the increased size of engines (supposed to be increased three times), the Australian vessels carrying a large proportion of coal, present opportunities of gaining 15 per cent. in many cases in cargo room, and further, that about 14 per cent. may be saved in the gross weights carried, taking machinery and coals together; or that so much more additional coal could be taken for a longer voyage without re-coaling.

In the foregoing Tables, the size or nominal horse-power of engines has been supposed to be increased three times, as a limit, but no advantage has been named as resulting from the diminished cost of the boilers, since, less steam being required to develop the same power, smaller boilers would suffice. Considerable advantage, however, would follow from this reduction; or advantages might be shown, in decrease of weight and space in the boilers; but it has been considered best not to encumber the calculations with so many considerations.

The gain in cargo space is altogether an additional saving to that already named as resulting from economy in quantity of coal, but this source of profit has only been shown in a per-centage of increase of cargo space, and no money value can be set upon it, as it varies so much with the nature of the trade and freight obtained.

The following Table, XVIII., presents a general summary of what has been before stated, and it will be seen from this Table, that until the quantity of coals taken in proportion to weight of machinery at least equals 1½ times, as in Class 3, or rather until it equals two times the gross weight of machinery, no change could be advantageously made by increasing the nominal horse-power or size of the engines; inasmuch as (on the conditions assumed) the weight of the machinery increases more rapidly than the weight of the coal diminishes.

In Classes 4 and 5, however, an *increase in the weight of the engines* is soon covered by the *reduction in weight of coal* required.

TABLE XVIII.—GENERAL SUMMARY.

Table compiled from the foregoing Tables, the Size or Nominal Horse-power increasing from 1 to 2 and 3 times (the intermediate sizes being omitted), and based on the supposition that in order to work expansively, the Engines must be increased in Cost, Weight, and Size, the Boilers being assumed to remain the same. The Steam Pressure supposed at only about 20lbs. above the atmosphere.

Class.	Service.	Ratio of Size or Nominal Horse-power.	Saving in Coal in per centage of Capital.	Increase of Capital per cent.	Total Weights of Coal and Machinery—Increase or Decrease per cent.	Total Spaces occupied by Coal and Machinery—Increase or Decrease per cent.	Cargo Space, Decrease or Increase per cent. When Total Machinery and Coal Space is *equal* to Cargo Space.	When Total Machinery and Coal Space is ¾ of Cargo Space.	When Total Machinery and Coal Space is ½ of Cargo Space.	Per Centage of Increase of Time the Coals would last, if the Total Weights be kept the same.	No. o Days the Coals will last, i Total Wts. be kep the same.
			Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Days.
1	River	1	...	...	Increases	Increases	Decreases	Decreases	Decreases	...	2½
		2	4·35	30	34	5	5	3¼	2½	...	...
		3	6·45	60	71	14	14	9¼	7	...	...
2	Continental	1	...	...	Increases	Decreases	Increases	Increases	Increases	...	10
		2	1·45	20	10½	6	6	4	3	...	...
		3	2·15	40	28½	5	5	3½	2½	...	...
3	Ocean (Short Voyage) ...	1	...	...	Increases	Decreases	Increases	Increases	Increases	...	15
		2	1·45	15	2½	6	6	4	3	...	...
		3	2·15	30	14	5	5	3½	2½	...	...
4	Ocean (Long Voyage) ...	1	...	...	Decreases	Decreases	Increases	Increases	Increases	...	40
		2	7·25	15	13	12	12	8	6	22	49
		3	10·75	30	14	15	15	10	7½	31	52½
5	Ocean (Voyage Out and Home)	1	...	...	Decreases	Decreases	Increases	Increases	Increases	...	70
		2	1·45	15	19	12	12	8	6	30	91
		3	2·15	30	25	15	15	10	7½	50	105

The increase in the weight of engines would be found to be about balanced by the decrease in weight of coal required, if the quantity of coal taken was equal to double the gross weight of machinery; the boilers being supposed to remain the same. In these calculations it must be remembered, that the boilers are supposed to remain the same, and the weight of the engines alone are supposed to increase in the ratio of 1¼ times the weight for double the size or nominal horse-power, and two times the weight for three times the size or nominal horse-power.

The importance of the gain in cargo-space, may be thus estimated, (taking the Australian vessels as an instance):—

Supposed capital of company	£100	0	0
Working expenses supposed at 65 per cent., with the coals 25 per cent.	65	0	0
To pay 5 per cent. the receipts must be	70	0	0
With engines increased to 3 times size—			
The capital increased to	130	0	0
Working expenses reduced by saving of 43 per cent. off coals at 25 per cent.	54	5	0
To pay 5 per cent. the receipts need only be (£54 5 0 × £6 10 0) .	60	15	0

But the receipts on former supposition are £70, showing an addition of 7 per cent. on the increased capital, or 9¼ per cent. on the original supposed capital.

To this add from 7½ to 15, say 10 per cent. on receipts, extra cargo space, equal to £7.

This gives total receipts	£77	0	0
Working expenses	54	5	0
Balance for dividend	£22	15	0

This on £130 equals 17½ per cent.

It can be shown also that with *improved machinery*, comparatively no extra capital would be needed, and that no additional space would be required in one engine room, so that a *saving of* 43 *per cent.* in coal would give 10¾ per cent. on capital in the case of Australian vessels, and add besides from 13½ per cent. to 27 per cent.—say 18 per cent. to the cargo space, and consequently to the receipts—

Thus capital	£100	0	0
Working expenses reduced to	54	5	0
Receipts as before, £70, to which add 18 per cent. = £12 12 0 for extra cargo-space, making total receipts	82	12	0
Leaving for dividend	£28	7	0

In the foregoing paper the object of the author has been merely to collect a few particulars of the different classes of vessels, and to give a rough approximation to the effects which would be produced by a certain saving in fuel, even did no alternative exist but that of increasing the size and weight of the engines.

There does not appear to be much doubt about a *saving in fuel*, even of 40 *per cent.* being made by *expansive working*, considering what is now the general average consumption.

If the present ordinary consumption be taken at 4½ lbs. of coal per indicated horse-power, a saving of 40 per cent. would reduce it to 2¾ lbs. per horse-power, and this quantity will appear ample, when it is considered that many land engines are working with 2¼ lbs. per indicated horse-power.

The pressure of steam assumed in the foregoing calculations of the saving of coal, where different sized engines are employed, has been only 20 lbs. above the atmosphere. A very much larger saving would however result, if steam of a higher pressure were used. The principle upon which the engines are supposed to be altered, is that of increasing the diameter of an ordinary cylinder, presuming the stroke to remain the same.

As the interests of marine engineers and steam ship builders must, in the long run, be identical with those of the merchants or companies employing them, it is clearly of the utmost importance to endeavour by every means to economize fuel. Little, however, can be hoped for so long as the merchant determinately refuses to pay for that economy in some shape or other. It is not to be expected that engineers will supply larger engines than custom necessitates, and for which they obtain no additional payment; nor will they exercise their talents to economize in that direction which appears least appreciated.

Considerable competition has for a long time existed amongst engineers for the purpose of reducing the space occupied by engines, but this has been done without reference to the question of economy in total space of machinery and coal, or without reference to economy *in consumption of fuel.*

[redacted]

This competition has been, nevertheless, productive of much good, as reduction in weight and space occupied by engines is of the utmost importance, other things remaining the same.

It is believed, however, that when the subject is better understood by merchants than it appears to be at the present time, they will no longer refuse to purchase the economy when offered to them.

Were the Government now to throw open a contract, where *economy in fuel* was the object sought, in the same manner as they did some years ago, when *economy in space and weight* were the objects, we might look for the same or greater benefits than then resulted from so advisable a plan.

The author has now to show in what manner he believes nearly all the advantages enumerated in the foregoing Tables can be obtained, by a peculiarly constructed engine of his invention adapted for the *expansive use of steam*, without those disadvantages which have doubtless prevented the more general adoption of the principle of expansion in marine engines, viz., the increased size, weight, and cost of the engines.

The degree of expansion to which it is necessary to work, in order to obtain great economy, would seem to require an arrangement of engine different from the ordinary one, inasmuch as the great variation of pressure from the beginning to the end of the stroke would cause considerable irregularity in the working of an engine where no fly-wheel can be employed. Added to this objection, there is also another of equal importance—the necessity of making all parts of the engine (where a single cylinder of large capacity is used for expansive working), strong enough to resist the greatest strain to which they are subject, namely, that at the commencement of the stroke, the weight and cost of engine rising also in a corresponding degree with its strength. In order, therefore, to overcome these objections, and adapt it for marine purposes, it seems necessary that an engine should be arranged on the following principles:

1st. That the steam on its first entrance should act upon a comparatively small area.

2nd. That it should finally expand to a considerable extent, the limit being determined by the friction of the machinery and the pressure of uncondensed vapour in the condenser.

3rd. That the variation in total pressure from the beginning to the end of the stroke should be as small as possible for any given expansion.

4th. That the work done by the in and out strokes (that is, of a horizontal screw engine) should be equal, or as nearly so as possible.

5th. That the horizontal or floor space occupied should be as small as possible—the height not being of great importance, if within say 6 or 8 feet.

6th. That the strain upon all parts of the engine should be as nearly as uniform as possible, and not concentrated at any portion of the stroke.

7th. That the steam, from its entrance to its exit, should work against a vacuum, if possible.

The arrangements shown in the accompanying engravings meet to a considerable extent the above conditions. They are all upon the *double* expansive principle, and therefore may be said to work with both high and low pressure steam.

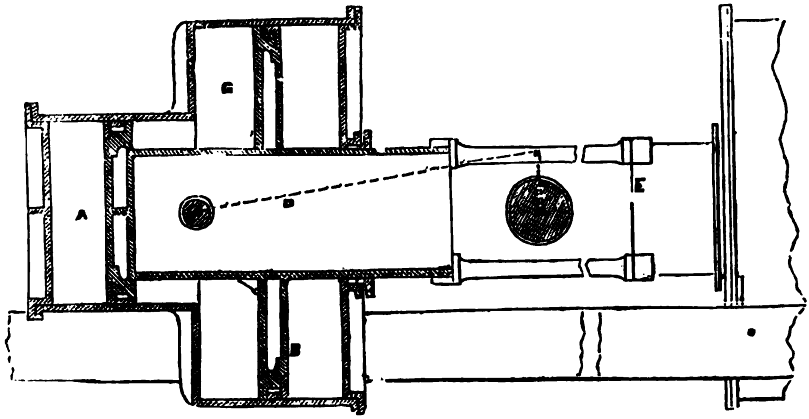
Figs. 1 and 2 (page 121) show an arrangement in which the high pressure steam enters into the upper part of the cylinder, and presses upon the *annular* space AA round the trunk—this being comparatively a small surface—it is cut off at $\frac{1}{4}$ or $\frac{1}{3}$ of the stroke, according to circumstances, and then is passed to the lower end B of the cylinder, in which it is expanded to the extent required, this being in the ratio of the annular space to the whole area of cylinder. During the time the high pressure steam is acting on the annular space AA, the lower part B of the same cylinder is open to the condenser C, and while the steam is expanding in the lower part of the cylinder, on an area equal to that of the trunk D, a vacuum is maintained in the bottom of the *opposite* cylinder F, and so admits of the greatest degree of expansion. The trunks D, E of the two opposite cylinders being firmly connected together by the rods HH, causes the pistons of both cylinders to move simultaneously, and the gross power exerted in each direction is made up of the pressure of the high-pressure steam in one cylinder, and the expanding steam in the other or opposite cylinder. The trunks are for the purpose of shortening up the engines as much as possible.

The main features in this arrangement are, first, that the atmospheric pressure on the outer end of the trunk is counterbalanced, which if not done would prevent the steam being worked so expansively, as the pressure of the atmosphere on the trunk would be added to the pressure of the high-pressure steam which is not required, and would have to be balanced by the expanding steam, which (in order to maintain an effective moving power) could not then be expanded to the same extent; and secondly, that the high-pressure steam acts only upon a comparatively small area.

Fig. 3 shows an arrangement by which an objection to a large trunk could be overcome.

This plan is much the same as Sims' arrangement, only having a trunk D attached to the pistons for economizing space, a vacuum is here maintained *constantly* in the space GG between the two pistons; the high-pressure steam acting on the bottom of the small piston

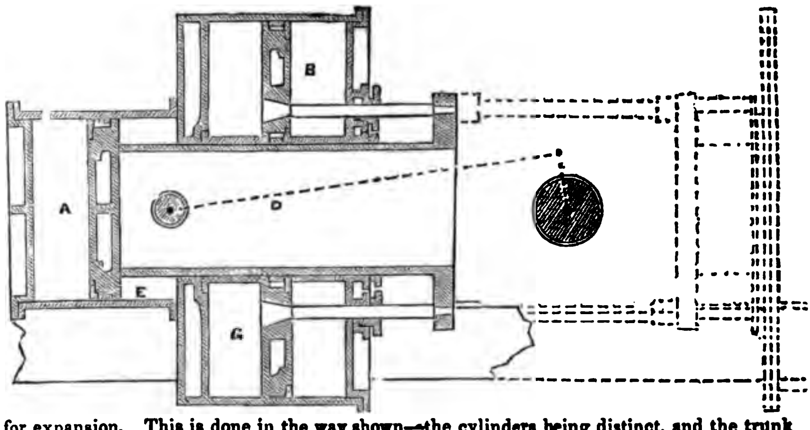
Fig. 3.



at A, and afterwards expanding in the annular space BB. The trunks D, E being small in this case, the same necessity would not exist for combining opposite trunks together, though in the event of the power being large and four cylinders employed, an evident advantage would follow.

Fig. 4 shows an arrangement by which an engine, on the above plan, could be made double-acting, that is, having high-pressure steam admitted on *both* sides of the small piston at A and EE alternately, and using *both* sides of the large piston BB and GG alternately

Fig. 4.



for expansion. This is done in the way shown—the cylinders being distinct, and the trunk D being encased as it were by a tube through the large cylinder—thus avoiding any internal stuffing-box. In this arrangement the large piston is an *annular* one, and the junction between the two pistons is made *externally* by two or more piston-rods FF being attached to the large piston and to the trunk.

There are several other forms in which the same principles may be carried out.

In fig. 1, where only two cylinders are required, the atmospheric pressure on the trunk may be counterbalanced by an opposite *piston* or *trunk* working in a fixed cylinder or condenser having a vacuum maintained in it.

The modifications would all depend upon the particular objects sought, and the conditions *to be fulfilled in each case.*

[redacted]

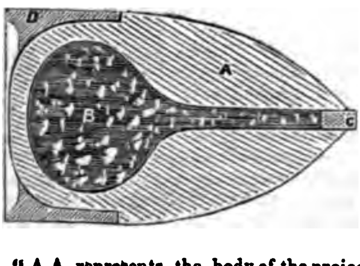
After the reading of the paper, the Chairman (Mr. W. Fairbairn, F.R.S.) observed that the subject of the further development of the expansive principle, in the different forms of steam engines, had become one of great practical importance, and had been at present only very partially carried out; they were most probably only on the threshold of extensive improvements in the steam engine, and particularly in the application of the expansive principle, combined with higher pressures than had been hitherto generally used. The degree of expansion of the steam was seldom carried at present beyond about three times, but he thought it might be carried up before long to ten times, or even higher, the important economy of which had been so ably shown in the paper read by Mr. Allen. To carry this out thoroughly, so as to obtain the full commercial benefit of the economy that was practicable, a considerably higher pressure of steam in the boilers would be requisite than was at present generally made use of; the pressure in the marine and land condensing engines had been already increased very generally from the old limit of 6 lbs. or 7 lbs. above the atmosphere to about 20 lbs. per square inch; and in the Cornish engines to 40 lbs. or 45 lbs.; but it did not appear impossible that this might be ultimately increased even to 100 lbs. or 120 lbs., as was constantly used in locomotive engines.

BRITTEN'S PATENT SHELLS.

Public attention having been drawn to the improved shells of Mr. Bashley Britten, by his own letters in the *Times*, and by a question put to the Government in the House of Commons by Mr. Roebuck, we think an accurate account of his invention will be acceptable to our readers. We accordingly publish the following description, which we take from the specification of the inventor.

"The object of this invention is to increase the range and accuracy of projectiles to be fired from cannon and other pieces of ordnance, by adapting to them the principle of the rifle, or spirally grooved gun; and also to construct the projectiles in such a manner as to provide for their flying with the same point constantly foremost.

"The general form of the projectiles is conical, as shown in the engraving below. They are to be inserted in the gun, so that the apex or point shall be towards the muzzle, and the base or widest part towards the breech.



"A A represents the body of the projectile, which is made of cast iron. B, a hollow cavity for containing explosive compound, which may be ignited by a common fuse, or other suitable means at the apex, C. This cavity so situated renders the hinder portion of the projectile of less weight in proportion to size than the fore part, so that the centre of gravity of the whole body will be in front of its greatest diameter, by which arrangement the flight of the projectile will be with its point in advance. D D represents a coating of lead, or other soft metal, which extends round the circumference of the projectile at this part, and is formed at the hinder extremity, as shown. On the explosion of the powder the edge or wall of soft metal at the circumference will expand, and be driven forwards till it completely fills the bore of the gun; and if the gun be rifled, or grooved, the soft metal will be forced into the grooves, and by following the spiral turn will acquire a rotatory motion, during flight, round the long axis of the projectile.

"The method of coating the projectiles with soft metal in such a manner as to stand the explosive force of the powder is as follows:—The iron is first coated with zinc by the process commonly known as the galvanizing process, and while sufficiently hot to keep the zinc in a fused state on its surface it is plunged into a mould or vessel of suitable form containing the lead, or other soft metal in a fused state, and then allowed to get cold. Care must be taken that the surfaces are free from tarnish or oxide; and the lead should be as near as possible of the same temperature as the zinc."

In his letters to the *Times*, the inventor states that in experiments made at Shoeburyness on the 26th of July, without at all straining the gun used, his shells, with little more than half charges of powder, acquired an effective range of about 1,000 yards more than the solid shot of the service with a full charge, while in point of accuracy his projectiles were far superior.

These shells will hold about twice as much powder as the shells of the service, and can be made to explode on striking in the same manner as the Lancaster shells.

"One of the most important features of the invention," says he, "is the facility with which it may be adapted, and the economy of its employment. All that is required is a trifling alteration in our present guns, which need not cost more than a few shillings each, and which could be made on board ship just as readily as elsewhere, and which would not weaken the gun or interfere with the use of the service charge when preferred. The gun used in the experiments was a common gun with the alteration.

"The shell would cost but little more than the ordinary ones, and taking into account the saving in some respects, the whole cost would not be greater than that of the ordinary charge for common guns."

Again, he says, in discussing Mr. Monsell's reply to Mr. Roebuck's inquiry, "It is now admitted that, on the 26th of July, my shells beat the solid service shot by 1,000 yards clear.

"Supposing that my invention had been on this occasion represented by a hostile gunboat, armed with only 9-pounder guns, but having my improvements, and that they had tested the invention by keeping about half-a-mile out of reach of the guns of the batteries, and plied them with my shells, would it, I ask, have been possible to save the place from destruction, even if all the monster service guns of the arsenal at Woolwich had been sent down by rail, and done their best to save it? If this be true, what shall we say about our two allied fleets in the Baltic and Black Sea? Nine months ago I pointed out the means by which their power might have been thus rendered utterly irresistible. These means having been ascertained, if they are not used by us they are sure to be used against us. On whom, then, will rest the responsibility?"

TRIALS OF REAPING-MACHINES.

On Tuesday, August 2nd, the various reaping-machines exhibited at the Paris Exhibition were subjected to a trial before the International Jury. A piece of oats was laid out in lots, one lot being appropriated to each of the machines tested, which were eight in number, three only being tried together, in order to give the Jurors the necessary leisure to examine the work, and to ascertain the speed of each.

The first trial took place with a small French one-horse reaper, a Bell's machine constructed in France, and Wright's American automaton, or self-raking machine, of which the latter gave results much superior to either of the others, the little French one being the first in merit of the other two. Wright's machine was attended by one man only; the raking apparatus worked well. Bell's machine was attended by three men.

The second trial was made with a Bell's machine by Croskill, Manney's Mower and Reaper, and another one-horse French machine. After making one round, Croskill's machine, which was worked with much exertion by two stout horses, broke down, and ended its trial. Manney's machine, which worked heavily (requiring all the power of two large horses), in consequence of not being well balanced, cut the rows crookedly, and the inclined discharge board with which it is fitted made the delivery difficult and irregular. The reel of this machine was considered to beat the grain too heavily, thus causing considerable loss.

In the last trial, which was between the machines of McCormick and Hussey, the former was shown to be by far the best, and produced results which placed it at the head of the whole of the machines tested. Beside cutting more than any of the others, it worked with great ease, and the cut crop was laid with great evenness and regularity by its side by one attendant as it moved along.

After the above trials with the crop of oats, McCormick's machine was challenged to compete with Wright's and Manney's in mowing a field of lucern, which, being very young and thin, was difficult to operate upon. The challenge being accepted and the trial made, the Jurors decided that McCormick's had again proved itself the best apparatus.

A third trial then took place in a crop of wheat, McCormick and Manney being again the competitors, and McCormick again beating his antagonist.

The results of these trials are most satisfactory to those who are fortunate enough to hold licences under Mr. McCormick's English patent, and who have reason to congratulate themselves on his undoubted success.

But even McCormick's machine has been found capable of improvement; and Messrs. Burgess and Key, of Newgate-street, London, have fitted to it an appendage which, we think we may say has perfected it as an agricultural instrument. Their improvement (which was illustrated on page 241 of our last volume, No. 1649) consists in adapting to the machine an Archimedean screw or screws, which deliver the crop evenly and uniformly at the side of the machine, and by the use of which the whole machine is made

[redacted]

self-acting, requiring the aid of no manual labour whatever.

A McCormick's machine, fitted with this improvement, was to have been submitted to trial with the others; but this arrangement was set aside in consequence of an agreement which was made, to the effect that only those machines should compete which had been actually exhibited in the Exhibition, which the finished machine had not. Another series of trials is, however, to be made on the 14th; and it is intended that Messrs. Burgess and Key's apparatus shall then be tested. It will also compete with others at Bristol on the 29th, at a gathering which is to take place in connection with the recent Carlisle Agricultural Show; and ample opportunities will thus be afforded for the display of its merits.

GARRICK'S RAILWAY LIGHT SIGNAL.

A description of this signal was recently read at the Royal Scottish Society of Arts. It consists of a stationary, clear light, placed at the beginning of any tunnel or curve, or near to a junction. Every passing engine changes the light to a red colour, which disappears gradually in ten minutes. The smallest glimpse of red light will caution the conductor of any approaching train that there is danger of running into another train not far in advance. The proximity of the latter to the lighthouse may be estimated from the perpendicular degree of red light observable.

THE OFFICIAL BOARDS OF THE STATE.

To the Editor of the Mechanics' Magazine.

SIR,—In your Number for July 28, (No. 1668), I observe a letter from Dr. Cattell, which opens a discussion on a question of the most pressing interest at the present time—the difficulties which beset an inventor in his attempts to introduce a novelty of any kind calculated to benefit the public.

I am quite sure that every intelligent mechanic, chemist, and other scientific person, resident in this country and in France, must have blushed with shame, and grown hot with indignation at the scandalous spectacle which the whole civilized world has witnessed for the two years last past on the waters and coasts of the Baltic and Black Seas. I am equally sure that many such persons, must feel perfectly well assured, that the helpless attitude of England and France before the fortresses of Russia, has resulted from the fact that, from some cause or other, these two nations are unable to cast even a tithe of the scientific skill which they possess into their war treasuries. It is incontestably true, that governments which boldly demand of their subjects millions upon millions of money in taxes and loans cannot be prevailed upon even to accept, when it is proffered, the ingenuity and skill which abound among those subjects. This fact is of itself sufficient to show that it is highly necessary for us to seek to obtain changes which shall open a way by which science may pass to take its natural place by the side of valour in the field.

The very importance of the subject is, however, a reason why it should be considered with care, and discussed with discrimination; and I therefore take the liberty of pointing out a misconception which prevails among some persons, and which Dr. Cattell appears to me to entertain. It is that, because it is highly desirable that really useful inventions should have no impediment placed in the way of their development, therefore every person who endeavours to effect a useful invention has a claim upon the public purse. Dr. Cattell asks, "Is it *fair* that one member of the community should suffer in his endeavours to benefit the whole?" To this interrogation, Sir, I emphatically answer, "Yes! in some cases;" or if I admit the existence of unfairness in such an occurrence, I am bound to say that that unfairness may rest entirely with the inventor himself. And that for the very plain reason, that there are innumerable individuals who may very sincerely *endeavour* to benefit the whole community, but who may at the same time be utterly incompetent to effect their object. Surely this cannot be doubted; and as surely it cannot be doubted that it would be highly impolitic and unfair to furnish such persons with a key of the public cash-box. Every day we have our attention directed to some one whose benevolent ambition outstrips his talents. You, yourself, Sir, gave us an illustration of this fact, drawn from literature, when you pointed out so clearly to your readers the vast discrepancy that existed between the intentions and the production of the author, in your review of Mr. Robert Hunt's "Elementary Physics."

Speaking from my own experience, I can safely assert that inventors, or *quasi*-inventors, are by no means always able to form a dispassionate judgment of their own powers, particularly when they are actuated by benevolent rather than selfish impulses; and although I am firmly persuaded that there

are in England at this moment men before whom the Malakoff Tower and the Forts of Cronstadt would speedily crumble into dust, I am, nevertheless, assured that there are also in England many more, who, while entertaining a high estimate of their own plans and contrivances, are quite without the ability to contribute the smallest item of success to our cause.

Having thus pointed out the necessity that exists for advocating the claims of inventors with caution and prudence, I have only further to remark, that the difficulties which attend the proper development of the inventive genius of the country, while they may serve statesmen with a ground for resisting particular claims, should have no other effect upon the public mind than that of producing a determination to see these difficulties fairly and fully encountered, and just encouragement given to all promising improvements. Great vigilance is now called for on this subject.

I am, Sir, yours, &c.,

A Reader.

London, August 6, 1855.

ON THE EXPLOSION OF STEAM BOILERS.

To the Editor of the Mechanics' Magazine.

Sir,—Having read in your last week's Magazine a communication from M. Andraud to the French Minister of Agriculture, Commerce, and Public Works, on the explosion of steam boilers, in which he states that the explosion must be caused by two masses of contrary electricity, resinous and vitreous, coming into contact, which *masses*, he states, are evolved with the steam, I shall be glad, if you will allow me, to say a few words on the subject.

Now, Sir, supposing two such masses to be evolved, as stated by M. Andraud, their coming into contact would in no way produce an explosion; they would only neutralize each other. But they could never be formed in any quantity, as supposed by him; owing to the conductibility of the vapour and water within the boiler, and also the boiler itself, they would be neutralized as soon as formed, *if formed at all.*

Again, the boiler is always in metallic communication with the earth; thus, by the steam pipe to the engine, and from thence, by the water pipe, to the well or tank for the supply of the boiler with water, which always conducts any electricity from the boiler to the earth as soon as formed.

In a paper read by Professor Faraday before the Royal Society, entitled, "On the Electricity evolved by the Friction of *Water and* Steam against other Bodies," *I think he clearly proves* that the electricity is not evolved with the steam, as supposed by M. Andraud. The object of the experiment detailed in his paper is to trace the source of the electricity which accompanies the issue of the steam. Professor Faraday relates that the electricity is never excited by the passage of pure steam, but only when water also is present; hence he concludes that it is altogether the effect of the friction of the globules of water against the sides of the opening, urged forward by the rapid passage of the steam. The effect of this is to render the steam or water positive, and the pipes from whence it issues negative. *Heat, by preventing the condensation of steam into water, likewise prevents the evolution of electricity*, which again speedily appears by cooling the passages, so as to restore the water which is necessary for producing the effect. Water will not excite electricity unless it be pure; the addition to it of any soluble salt or acid, even in minute quantity, is sufficient to destroy this property. The addition of oil of turpentine, on the other hand, occasions the development of electricity of an opposite kind to that which is excited by water. A similar and more permanent effect is produced by the introduction of olive oil along with the water. Similar results were obtained by substituting for steam a stream of compressed air.

There are several additional facts tending to confirm the opinion that friction is the cause of the excitement of the electricity thus produced, and not evaporation or mere change of density in the steam. In Faraday's experiments no electricity was excited when the safety valve was opened wide, and the steam escaped without friction; but when it was allowed to impinge on a cone, electrical effects were directly manifested.

Thus I think we may safely come to the conclusion, that whatever may be the force that explodes steam boilers, that force is not electricity.

I am, Sir, yours, &c.,

E. W. F.

Clerkenwell, August 7.

LIEUT.-COLONEL PARLBY ON THE FLIGHT OF PROJECTILES.

To the Editor of the Mechanics' Magazine.

Sir,—In continuation of the description of my shot, proposed in your last, I may mention that it is applicable to all descriptions of fire-arms, and that the fore part of the cone, as well as the wings, may be made of malleable iron or steel, upon which the lead or cast iron may be cast; and by a due adjustment of the proportion of malleable iron, the centre of gravity, even in a solid shot, may

[redacted]

be secured in the middle of the shot, that is, equidistant from the two ends or the apexes of the cones.

The bottom, which in using this form of shot is of most important use, is formed as represented in fig. 1, which is a perpendi-

Fig. 2. Fig. 1.

cular section through the middle; and in fig 2, which shows the shot and bottom complete, ready for loading, two slits, one of which is seen at *a*, being cut for the wings.

By using this bottom, which may be made of wood, papier maché, or other suitable material, the following important results will be obtained:

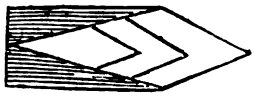
1. The axis of the shot will be duly placed in the axis of the bore of the barrel, and it will be retained in this advantageous position until it quits the muzzle of the gun.

2. The shot will be fixed or wedged in the barrel by the last stroke of the rammer, when the bottom comes in contact with the load or cartridge, so that no wad is required over the shot to keep it steady and close to the charge, even in ships of war, however violent the motion of the vessel may be.*

3. The bottom, by wedging round the shot, will prevent any of the elastic gas from escaping, whatever windage the shot may have.†

4. It will enable, in case of necessity, the

Fig. 3.



use of shot of any less diameter than the bore of the gun, to be fired as truly as if they fitted the bore. Fig. 3 will illustrate this—of course, supposing there is a supply of large bottoms to fit the piece.

5. It will prevent the injury to the internal surface of the bores of all guns, but particularly to those made of gun metal, from the iron shot grazing or striking along the interior, as takes place with common shot.

The bottom may be in two separate halves, fastened or tied together with packthread or wire.

And here I may state a fact which I have often proved myself, but which may not be known to all your readers. A light body will be moved by the propelling force of gunpowder with greater velocity than a heavy one. If a common bottle cork is fired from a fowling-piece or musket directly against a brisk wind, the cork will be driven out with great velocity, and will range forwards some distance; but not having sufficient momentum to overcome the reaction of the compressed air in front of the cork, it will be forced back by the reaction of the air, and will either strike the person who fires it, or pass to his rear. This experiment alone proves of how little use the studies and theories of philosophers in their closets are in the practice of projectiles. It shows also how little a tight wad placed in front of a shot with windage can be available in keeping it steady as it passes along the bore, as the gas which escapes by the windage will drive the light wad out of the muzzle before the shot reaches it.

Gunpowder, it is well known, is the material we use in our fire-arms as the medium to form our projectile power; and I believe its advantages to be far superior (for this purpose) to any other chemical compound we are yet acquainted with, for reasons which I shall give as I proceed.

When gunpowder is inflamed, it produces a vast quantity of highly elastic air or gas, which is supposed to exert a force by expansion of the pressure of 1,600 atmospheres, or $1{,}600 \times 15 = 24{,}000$ lbs. on the square inch of surface.*

Fortunately, the inflammation of gunpowder is progressive, and not instantaneous; if it were instantaneous, there is no material that would be strong enough to re-

* Sir Howard Douglas, in his "Naval Gunnery," Second Edition, p. 128, states, that he has occasionally seen the operation of ramming home a tight wad take up two or three minutes!

† The bottom is to be formed rather concave at the end next the charge, as the first action of the propelling force will then expand it towards the interior of the bore in simultaneous action with the sliding of the fore part on the conical end of the shot, and thus effectually prevent the loss of gas by windage.

* This is Dr. Hutton's estimate from numerous experiments, but the exact computation of this force is a difficult attainment, as there are results attending the explosion of gunpowder, under varied forms, which present some phenomena which can hardly be explained. An ounce of gunpowder fired in the open air seems to produce a very harmless effect, but Count Rumford, in one of his experiments, with two ounces of this material inflamed in the chamber of a large mortar, lifted a cannon of several tons weight placed over

sist the explosion without bursting. Attempts have been made by the mixture of chlorate of potash and other matters to improve the force of gunpowder; but they failed, either from the bursting of the gun, or the shattering of the shot, and were therefore very wisely abandoned.

It may be well, therefore, for chemists to consider that they will never be able to find a substitute for gunpowder, until they can produce a compound which will yield a greater quantity of elastic gas, at the same or in less time than that in which gunpowder produces it; and the amazing force of gunpowder, when it is exploded, will at once be a convincing proof that any projects or proposed advantages with steam guns over those where gunpowder is used must be visionary.

As the inflammation of gunpowder is not instantaneous, but progressive, the consideration of this fact should not be overlooked, as it has been generally, in the construction of cannon, so that every day we hear of fatal accidents from the bursting of our cannon both by sea and land.

If the inflammation of gunpowder were instantaneous there would be no necessity for any length of barrel in the piece from which the projectile is discharged, as it would be quite sufficient to have an adequate capacity of chamber for the charge of gunpowder, and of a cylinder equal in length to a diameter or semidiameter of the shot; but we know that this will not answer in practice.

We find also that beyond a certain quantity of gunpowder in charging a cannon that we get no increase of range in the projectile discharged from any further addition to the load; for this simple reason, that the surplus quantity of the grains of powder are driven out at the muzzle before they have time to generate their due proportion of elastic fluid within the barrel of the piece, and can therefore have no possible effect upon the solid body projected; for we must always keep in mind, that all the projectile power on the shot is extinguished the moment it passes out of the muzzle of the piece, and the shot then only moves forward by the momentum which its particles of matter have received from the expansion of the elastic gas, as long as it was passing along the barrel, when the expansion was confined to one direction.

Are we therefore at once to admit that there is a limit to the range to which we can throw a projectile by the means of gunpowder? I say certainly not; whether it is one mile or twenty miles, the range can be effected:—for it would be very easy to ignite the largest quantity of gunpowder that could be accumulated, in 100 points at once, by means of electrical action properly applied; and thus, instead of the slow progression of igniting by one vent or touch-hole, we should precipitate the production of the elastic gas one hundred fold! The only difficulty would be to construct a piece of ordnance strong enough for the purpose; but it may be done, and the range of a projectile may be thus increased to a distance perhaps never contemplated.

As the elastic gas, therefore, is the projectile power of gunpowder, it is evident that if we allow any of it to escape without acting upon the projectile, we lose so much power. A great deal escapes through the vent or touch-hole, and a great deal more is lost from the windage, or the difference of the diameter of the bore and the shot; which, if a shot fitted as tight as a piston in a cylinder, would not be the case.

To remedy the loss by windage is an easy matter; it is accomplished by an expanding shot or bottom, but the remedy of the loss by the vent requires consideration. It has been found by experiment that gunpowder does not ignite so quickly in a close chamber without a slight communication with external air, as when that is the case; and thus it has been found that with the Prussian needle gun a small chamber containing air in the vicinity of the charge was necessary to ensure the perfect ignition of the charge. The ingenious Captain Norton, who proposes to fire cannon without vents, by means of a friction igniting apparatus, may perhaps not be aware of this circumstance; but experiments have been tried years ago with various sized vents, and when reduced to the minimum, a decrease of range was experienced. It is evident that directly a sufficient power is formed by the inflammation of the charge to move the shot forward, it will begin to move; the quick ignition of the whole charge before the shot quits the muzzle is, therefore, of the greatest importance. I find my paper has already, perhaps, exceeded the space you can allow. I must, therefore, reserve the notice of the rifle and some other matters to your next.

I am, Sir, yours, &c.,

SAMUEL PARLBY.

the muzzle, and burst the mortar. In another experiment, a very large charge of many pounds was confined in a brass cannon, with the opening at the muzzle screwed up; the whole charge on being ignited, as usual, at the vent, discharged itself gradually with a loud noise, through the *vent*, without bursting the gun.

[redacted]

LONG RANGE AND VERTICAL FIRE.

To the Editor of the Mechanics' Magazine.

SIR,—I have some objections to offer to the matter of "Civil Engineer's" letter, which appeared in your last number. Perhaps you will not esteem them unworthy of a portion of your valuable space. Permit me to say at starting, that, though I claim the honour of an humble place amongst the practical part of the community, yet I have no sympathy with those who are sufficiently egotistic to sneer at the services which most people acknowledge to have been rendered to civilzation by those scientific men whom these self-admiring individuals term theorists. This habit of persons styling themselves "practical," I imagine, arises from a species of mortified vanity which does them very little honour. The fact is, that no class of men construct so many theories so little in harmony amongst themselves as do your "practical men." Their vexation generally arises from the fact, that in very few instances are their crude theories adopted; the world having views which serve its purpose better. Even the successful man, who is purely "practical," ordinarily works by methods which none but himself can either use or understand. They serve his own narrow and restricted aims tolerably well but are of very little, if any, further service to the world.

Judging from his letter, I cannot avoid thinking that your correspondent, "Civil Engineer," ranges himself amongst the class I have described. He desires to place what he terms "theories" and "antiquated notions" in antagonism with the progress of "improvement and discovery," and his attempts, like most such, serve only to show that he does not appreciate or understand the object of his attack. We have theories in the various branches of natural science, which are correct interpretations of large classes of well ascertained facts. To prove that these are of some value and service in the progress of "discovery," I need only point to the discovery of the planet Neptune, by Mr. Adams; a discovery made by means of calculations founded on the very theories which "Civil Engineer" and Mr. Hopkins attack so readily and so inconsiderately. The opening sentence of the letter is, in my humble opinion, wholly erroneous.

"It is a fact well known to practical men that the angle for the greatest range is 45°, and that shells, when thrown at this angle, drop vertically on approaching the horizon." This appears to me a very unfortunate statement to make in connection with what goes before. For supposing it to be the fact, that 45° is the angle of projection corresponding to the maximum range, the fact would be in favour of the theorist and not of "Civil Engineer;" 45° being the value of the angle for maximum range which is given by the theoretic investigation which "Civil Engineer" is so anxious to repudiate.

But, further: has your correspondent any real ground for his statement, that such is the actual elevation for greatest range? I suspect, for my own part, that the said statement is more remarkable for its boldness than for its correctness. There can be little doubt that, notwithstanding the supposed confident knowledge of practical engineers, and the late disquisitions of newspaper correspondents on the subject, that 45° is not the angle of projection proper to greatest range. It is certain that in vacuo this would be the value of the said angle, the path of the projectile then being parabolic. And it is almost certain, from the wide difference between such a path and the actual one, that the angles of maximum range in the real and in the imaginary case would not be identical. At any rate, "Civil Engineer" will not, perhaps, object to furnish your readers with some account of the experiments upon which his proposition rests. Whether, indeed, it has any other foundation than the authority of the mathematician who is so ungratefully treated by the men who are continually making his thoughts and labours their servants.

As to the shell dropping vertically as it approaches the horizon after having been projected at the above repeatedly-mentioned angle, that is, *à priori*, strictly untrue; the shell describes a curve whose descending branch has what mathematicians call a vertical asymptote, that is, the shell path approaches continually nearer and nearer to a vertical straight line at a finite distance from the initial position of the shell; yet, however far its course be pursued, it never can be accurately vertical. That it should fall vertically as it approaches the horizon is, in simple terms, not even possible.

In the next sentence we have, "Yet this fact is not recognized by our mathematicians." This, too, is not true; for none know so well as mathematicians, that they are unable to grapple successfully with the problem in its full conditions. This Herschel is careful to set forth in connection with the passage appended to the letter of "Civil Engineer." I will not trouble you with any notice of the extract from Mr. Hopkins' work at present. I propose, with your permission, to say something regarding it another time.

I am, Sir, yours, &c.,

A MECHANIC.

To the Editor of the Mechanics' Magazine.

Sir,—I fear your correspondent, "Civil Engineer," is trenching on dangerous ground; he will set the moon in motion again, and re-lunaticise us all. He actually cites the dangerous and heretical author to whom I had referred. But as the mischief is done, I beg to ask the solution of a difficulty from some of your qualified readers, Mr. Wilkinson, for instance, whose interesting notes on mathematical history greet your pages like angels' visits. The question is, at what date did the old received theory of the parabolic path of projectiles yield to the doctrine quoted from Herschel, that the angles of ascent and of descent are equal? This notion is also taught in the figure at the bottom of page 107, and which very singularly is the very same I refer to at page 110. The parabolic doctrine used to be generally received: see, for instance, Carnot's Treatise on "Vertical Fire," which it appears has lately been re-invented by the *Times*. I forget the exact title of this book; I read it many years since, when I was going through La Grange with an enthusiastic calculist, an old pupil of Poisson, whose ardent patience I often sadly tried, by doubting if all were not sophistry, when I had to "devil up" an equation. I never rightly satisfied myself that cutting off the corners of a square would realize a *physical* circle, nor by what sorites a parabola could merge or be transformed into a substantial ellipse. I had not faith enough to make firm progress upon slippery ground. But from more practised travellers I have often wished some explanation to reconcile Sir John Herschel's equi-angular teaching, with the old figure of the pump diagram, very familiar to the Fire Brigade, at page 107, and am glad your correspondent has afforded occasion to put the query.

I remain, Sir, yours, &c.,

David Mushet.

August 6, 1855.

PROJECTILES.

To the Editor of the Mechanics' Magazine.

Sir,—Having observed Lieut.-Colonel Parlby's projectiles in your last number, I may state that I have used bullets exactly the same as fig. 3, page 109, only with three wings; and I doubt not, that if it were possible to get them to come out of the barrel as safe as one can put them in, they might be the best bullet yet out. I may also state, that it was the study of the swallow and the fish that made me try the same, considering that if a vacuum did not exist behind a bullet, yet there is a *greater pressure on* all sides than behind; and in this form of bullet, I consider that the atmosphere pressing on the foremost cone retards it, and that on the other cone or tail assists it, though not to the same extext. All this may do in theory; but when I came to use these bullets I found the flight to be pretty regular at a short distance with a small charge, but when I used the usual charge they were worse than any I ever tried, sometimes taking the ground half way to the mark; and the reason of this was simply, the head being too heavy for the tail, and the lead being soft, when the bullet came out of the gun, instead of being the usual length of one five-eighths, it was scarcely an inch; that is, the tail and wings were compressed till the lead filled the barrel. I should therefore be glad to hear that it was possible to send these bullets out of the gun in safety.

I am, Sir, yours, &c.,

George Hunter.

Laysmill, August 6, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Saunders, Jonathan, of St. John's-wood, Middlesex. *An improvement in the manufacture of axles and shaftings.* Patent dated January 16, 1855. (No. 115.)

This invention consists in folding or bending sheet or plate iron into a volute pile, then applying round such pile segmental or other form of bars and then heating and rolling or hammering the whole into an axle.

Oudin, Jean Antoine François Victor, of Mons Department of Seine and Marne, France, priest. *A new liquid for preventing sea-sickness.* Patent dated January 16, 1855. (No. 116.)

"I distil," says the inventor, "$\frac{1}{8}$ oz. (troy) of hydrochloric acid in 5 oz. of alcohol and mix the product in 32 to 38 oz. of water. I sweeten the liquid with syrup of sugar. I however compose the liquid by preference of $2\frac{3}{4}$ oz. (troy) of dry chloride of lime, mixed with 8 oz. of water, to which I add $10\frac{5}{8}$ oz. of alchohol. The whole is distilled by ordinary means until I obtain as a product $5\frac{1}{4}$ oz. of the liquid. I afterwards mix this product in a stone or glass beaker with 32 to 38 oz. of water and sweeten it with syrup of sugar. I add to one or the other of these liquors a few drops of essence of mint or bitter almonds and give it a rose coloured tint by a weak solution of cochineal."

Garrood, George William, of Burnham, Essex. *An improved apparatus to be used in conjunction with windlasses on ships, cranes on land, and with other machinery for*

raising or lowering weights for the purpose of guiding and controlling the action thereof. Patent dated January 17, 1855. (No. 118.)

This apparatus consists of a grooved barrel over which the chain travels; the groove is made to clip and firmly hold each alternate vertical link of the chain in such manner as to hold the chain quite fast. A break is fitted to the apparatus so that in running out the chain, the speed may be regulated as required, or stopped altogether if necessary.

Horton, Joshua, of Birmingham, Warwick, manufacturer. *An improvement or improvements in packing or storing gunpowder.* Patent dated January 17, 1855. (No. 120.)

This invention consists in the manufacture and use of vessels or cases made of iron and coated with zinc or tin for the purpose of packing or storing gunpowder.

Quertinier, Ambroise, of Charleroi, Belgium, merchant. *An improvement in glass furnaces.* Patent dated January 17, 1855. (No. 121.)

This invention consists in causing heat, ignited gases, hot air, and products of combustion to pass from the fire-place of glass furnaces through side channels or apertures, and to circulate under the floor of the melting chambers, so that the greatest possible transmission of heat to those chambers shall be obtained.

Davidson, David, of Meiklewood, by Stirling, North Britain, captain in the Hon. East India Company's service. *Improved apparatus for pointing ordnance, and restoring the aim of the piece, either by day or night, when it is once obtained.* Patent dated January 17, 1855. (No. 123.)

Claim.—The application to guns or pieces of ordnance of either a telescope or plain sight provided with cross wires, so that by means thereof, in conjunction with a collimator, or other analogous contrivance, the piece of ordnance may be brought into its proper position after every discharge without the necessity of observing the object to be struck. Also, the use of the collimator for facilitating this operation.

Webster, James, of Collingham, York, corn miller. *Improvements in the application of motive power.* Patent dated January 17, 1855. (No. 124.)

The inventor employs a hollow shaft, upon which is mounted an ordinary driving wheel, and from this hollow shaft elbow pipes branch off and are supplied through the centre shaft with steam or other elastic fluid. The ends or mouths of the elbow pipes fit closely to, and work against, apertures or boxes which are made upon or fixed to wheels that rotate upon axes fixed to the fly wheel, which is fixed to the shaft that turns the driving wheel before mentioned. The pressure or impact of the steam or other source of power upon the boxes or apertures causes the wheels upon which they are fixed to revolve, and the under surface of these wheels having cog-teeth fixed upon them, which gear into the teeth of a stationary wheel with its teeth turned inwards, a regular rotary motion is imparted to the central shaft.

Hall, Edward, of Salford, Lancaster, gentleman. *Improvements in combining metallic wires with textile materials, or fabrics for forming wire ribbon.* Patent dated January 17, 1855. (No. 127.)

Claim.—"The production of ribbon wire, by cementing wires with one or more thicknesses of woven fabric or fibrous material."

Duméry, Constant Jouffroy, of Paris, France. *Improvements in smoke-preventing apparatus.* Patent dated January 18, 1855. (No. 129.)

This invention comprises certain charging boxes; a grate which is movable in the vertical direction upon its whole surface; a fixed grate having artificial or moulded fuel and a charging drawer; troughs with vertical grates for natural coal with a discharging drawer; curved scuttles, horns, or trumpets, that are stationary, and in which the coal alone is displaced; &c.

Leigh, Evan, of Collyhurst, Lancaster, machine-maker. *Certain improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.* Patent dated January 18, 1855. (No. 133.)

"In the present mode of making cotton laps on blowing machines and others termed 'Derby Doublers' there is nothing," says the inventor, "but the cohesion of the fibres of the cotton wool, when pressed, to bind the laps together, and great inconvenience arises and much waste is occasioned by the rolls sticking together whilst unlapping at the carding engines, &c. My invention consists in preventing this inconvenience and waste, and is accomplished by traversing a bobbin of slubbing or of soft twisted cotton (or sliver of cotton twisted or untwisted) from a can transversely across the machine whilst the lap is being made, and allowing such slubbing, roving, or sliver to draw off the said bobbin, or be withdrawn from the can through the calender rollers of the machine, and be rolled up with the lap in a zigzag or diagonal direction."

Johnson, William, of Lincoln's-inn-fields, civil engineer. *Improvements in the application, treatment, cleansing, and dyeing of fibrous substances and products.* (A communication.) Patent dated January 18, 1855. (No. 135.)

This invention consists in a method of treating vegetable matters containing lig-

neous fibres, in which they are boiled in a solution containing a mixture of caustic lime, water, and caustic soda or potash, then washed and subjected to the action of either steam or boiling water, and then treated with a cold solution of chloride of lime, or other bleaching liquor. Chlorine gas or the fumes of sulphur may also be passed through the solution whilst it is hot, to increase the effect. In some instances, and especially in the retting treatment of flax, straw, and other matters, the inventor considers it advantageous to acidulate the heated water with sulphuric or muriatic acid. A small proportion of caustic lime, soda, or potash or other salt, may also be added with advantage prior to the application of the chlorine compounds.

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *Improvements in the construction and operation of self-acting railway breaks.* Patent dated January 19, 1855. (No. 142.)

"This invention," says the patentee, "relates—1. To the placing of the bumper heads which apply the momentum of the carriage to the working of the breaks, one on each side of the coupling, so that the said heads shall come against the carriage or the platforms thereof, instead of abutting against each other; by which means I use *all* the play between each pair of carriages, in applying the breaks instead of only one-half the distance, as is the case when the break-heads or buffers abut against each other;" and, 2. To a method of throwing several breaks into and out of action simultaneously by means of certain lifting pieces, rollers, and connections.

PARIS, STANISLAUS JOSEPH, of Manchester, embosser. *Improvements in machinery for embossing.* Patent dated January 19, 1855. (No. 143.)

The inventor describes an arrangement and combination of machinery for embossing, and for varying the position of the articles embossed, which we shall probably recur to hereafter.

MARTIN, ROBERT, of High-street, Tottenham, Middlesex, and JOSEPH HYAMS, of Union-street, Bishopsgate. *Improvements in goloshes or over-shoes.* Patent dated January 19, 1855. (No. 144.)

This invention consists in so forming those parts of the golosh or overshoe, which are intended to embrace the toe, the heel, and the sides of boots or shoes, as that when it is applied thereto, it only extends sufficiently far over the boot or shoe as to hold it securely upon it, and to cover those parts where the junction of the sole and heel with the upper leather occurs.

ISAACS, SAMUEL, of Newman-street, Oxford-street, Middlesex. *Improvements in the manufacture of artificial coral.* Patent dated January 19, 1855. (No. 145.)

Claim.—The manufacture of artificial coral by causing alabaster to be impregnated or saturated with oil or grease, and colouring or dyeing matter, with or without powdered coral, after having been treated with dilute acid.

CLARKE, JOHN IRWIN, of Windsor-court, Monkwell-street, Middlesex. *Improvements in applying colour to the edges of leather gloves.* (A communication.) Patent dated January 19, 1855. (No. 146.)

These improvements consist in causing the edges of leather gloves to be coloured before they are sewn.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in obtaining electro-motive power.* (A communication.) Patent dated January 19, 1855. (No. 148.)

The patentee describes certain arrangements of electro-magnetic machinery, "taking for base that the electro-magnetic element of the motor is the attraction which exists between a helix or coil of insulated wire, and an iron core or magnet moving within it; that is to say, the reaction between the conductor and the iron."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

STEFANI, MARC TOUSSAINT, of Paris, France, gentleman. *Improvements in firearms.* Application dated January 15, 1855. (No. 108.)

These improvements consist in forming in the centre of the hinder part of the interior of the breech, a long chamber for receiving the charge of powder, and for leaving a space between the powder and the ball.

YEOMAN, JAMES, of Walworth, Surrey, millwright and engineer. *Improvements in self-feeding furnaces.* Application dated January 16, 1855. (No. 111.)

On the front ends of a set of moveable bars the inventor fixes a short plate, which works under the hinged bottom of a hopper filled with coal. The motion of this plate pushes the coal into the furnace, and the motion of the moveable bars carries it forward.

MARYON, ROBERT JAMES, gentleman, of York-road, Lambeth, Surrey. *Improvements in the construction of steam engines, which consist of a better means of mechanism for effecting the transmission of, and conversion of action of motion for working and applying steam or other equivalent motive power.* Application dated January 16, 1855. (No. 117.)

This invention relates to a modification

[redacted]

of one portion of the steam engine improvements patented by the inventor on 13th July, 1854, and consists in working a certain gland-slide inside instead of outside of the cylinder.

LOMAS, SAMUEL, of Manchester, machinist. *Improvements in machinery for winding or doubling silk.* Application dated January 17, 1855. (No. 119.)

These improvements in winding-machines consist in an improved mode of constructing the swifts on which skeins of silk are distended. The inventor connects the sticks of the swift by a piece of leather or other suitable material, to which is attached a spring to hold the skein to the right diameter. By this means the wooden cross bars and tightening strings are dispensed with, and the waste of the silk is diminished. The improvements in doubling-machines consist of a double detector, by means of which the bobbin in which the silk is wound is stopped when the silk is too thin or too thick.

COLES, ALEXANDER, of Millmount, Kilkenny, Ireland, marble-manufacturer. *Improvements in sawing marble and similar materials.* (A communication.) Application dated January 17, 1855. (No. 122.)

This invention consists in suspending the swinging frame which carries the saws horizontally from the overhead transverse beams or chopping bars, by short chains in place of long lengths, as has been hitherto adopted abroad, by which means a chopping as well as a sawing action is effected.

HIGGINS, JAMES, of Salford, Lancaster, machine-maker, and THOMAS SCHOFIELD WHITWORTH, of the same place, mechanic. *Improvements in moulding for casting shot, shells, and other articles.* Application dated January 17, 1855. (No. 125.)

This invention consists—1. In causing the pattern employed in casting spherical bodies to rotate during the operation. 2. In connecting with the rammer employed for ramming the sand an elastic part to yield to undue resistance. 3. In ramming sand by means of a roller or rollers caused to rotate within the box, and permitted to rise as the sand accumulates above the pattern. Another part of the invention consists in a method of smoothing the mould for spherical castings, in order to effect the operation now practised with the hand trowel.

SLACK, JOHN, of Manchester, Lancaster, manager. *Improvements in the manufacture of velvets, velveteens, cords, and other woven fabrics in which floated threads or loops are formed for the purpose of being cut.* Application dated January 17, 1855. (No. 126.)

This invention consists in so regulating the shedding of the warp and the throwing of the weft as to produce on both sides of the cloth floated threads or loops, which, being cut by the ordinary process, will constitute a piled surface of similar character on either side.

FLOWER, LAMOROCK, of Great Russell-street, Bloomsbury, Middlesex, and GEORGE AUGUSTUS DIXON, of Cobham-hall, Stratford, Essex. *Improvements in machinery or apparatus for sifting and cleansing.* Application dated January 17, 1855. (No. 128.)

The object of this invention is to apply machinery so as to give several sieves a motion or series of motions that will facilitate their action.

SURGEY, JOHN BAILEY, of Lidlington-place, St. Pancras, Middlesex. *Certain improvements in carriages.* Application dated January 18, 1855. (No. 130.)

This invention primarily consists in constructing a carriage with one row of seats placed alternately facing the two sides of the vehicle.

BLACKWOOD, THOMAS, and ANDREW GORDON, both of Paisley, Renfrew, engineers. *Improvements in motive-power engines.* Application dated January 18, 1855. (No. 131.)

In carrying out this invention, three cylinders (furnished with pistons, &c.,) are attached to a disc which is connected to the engine shaft, and the several connecting-rods, issuing by preference from the inner ends of the cylinders, are jointed upon a fixed or stationary abutment pin, about which they are capable of revolving, and this pin is placed eccentrically to the axis of the main shaft to an extent equal to half the stroke of the pistons, so that when the engine is at work, the disc with its cylinders revolves round with the shaft.

LANCASTER, WILLIAM, of Preston, Lancaster, cotton manufacturer. *Improvements in "temples" employed in the manufacture of textile fabrics.* Application dated January 18, 1855. (No. 132.)

This invention relates to a peculiar construction and arrangement of the teeth or cloth-holding portion of temples, and also to an improved form of cover to be used in connection with them. The improvements consist in the employment of one or more small rollers, composed of any suitable material (brass being preferred). These rollers are furnished with several series of teeth or toothed discs, situated at equal distances along the entire length of the rollers, but so arranged as to occur alternately on each roller, so that when the two rollers are working together the several series of teeth on the one roller will correspond to the intervening spaces on the other. Over these toothed rollers is placed a cap or cover of an improved form, the inner surface of it being grooved or fluted to correspond with the

series of teeth on the rollers. The edge of the cloth at each side of the loom passes between the rollers and the cap or cover, which being grooved internally, forces the teeth into the cloth as it passes along to the beam, and thus keeps it to its full width and prevents contraction, while the forward motion of the cloth is not impeded.

PARTRIDGE, HENRY, and JOHN BENJAMIN BROOME, of Birmingham, Warwick, gun-manufacturers. *Certain improvements in the manufacture of wrought-iron ordnance.* Application dated January 18, 1855. (No. 134.)

This invention consists in manufacturing a piece of ordnance from two pieces of metal, semicircular in section, the edges of which are brought together and rolled upon a suitable mandril.

PIDDING, WILLIAM, of Putney, Surrey. *Improvements in the manufacture of combs for the human hair.* Application dated January 18, 1855. (No. 136.)

This invention consists in forming combs of glass, glazed or enamelled metal, porcelain, china, or papier maché.

PIDDING, WILLIAM, of Putney, Surrey. *Improvements in the manufacture of building materials, and in the machinery or apparatus for making the same.* Application dated January 18, 1855. (No. 137.)

The inventor cements together large and small pieces of coke, pumice-stone, broken or pulverized stone, sand, porcelain, chinaware, earthenware, glass, shells, bones, and earthy and metallic matters, in various proportions, with a siliceous cement, formed of pulverized silica dissolved in a digester, in a highly concentrated solution of alkali, rendered caustic with lime under great pressure.

PIDDING, WILLIAM, of Putney, Surrey. *Improvements in coverings for the feet of bipeds and quadrupeds.* Application dated January 18, 1855. (No. 138.)

The inventor purposes to manufacture the soles and heels of boots, shoes, goloshes, and slippers, and also horse shoes, of caoutchouc or compounds thereof, having in it cells of various sizes connected together, and enclosing in them air, gas, or liquids.

LAWRIE, JAMES GRAY, of Glasgow, engineer. *Improvements in the sights of fire-arms and cannon.* Application dated January 18, 1855. (No. 139.)

The inventor constructs a sight in such manner that the hole or passage through which the object to be fired at is seen shall be caused to vary as the barrel or gun is elevated or depressed, the vertical passage being decreased or reduced as the object to be fired at is more and more distant.

NYILASSY, MICHAEL JOSEF, of Chandos-street, Covent-garden, Middlesex. *Improvements in wind musical instruments in the nature of the bugle and the trumpet.* Application dated January 18, 1855. (No. 140.)

The inventor describes an instrument so constructed that if one portion of it be alone sounded it will produce the same effect as a bugle; and if between the mouth-piece and the tube of this portion is interposed a tube of brass, a spring valve, and a turning slide, when the valve is pressed on and the whole instrument is sounded it becomes a trumpet. The bell and tube are of copper.

BELL, SAMUEL ALEXANDER, and JOHN BLACK, of Bow-lane, Cheapside, London, vesta-light manufacturers. *An improvement in the manufacture of congreve or lucifer matches.* Application dated January 18, 1855. (No. 141.)

The inventors taper or point that end of the match which is to receive the composition, and are thus enabled to dip the matches in bundles into the composition without requiring to use the clamp frame which is now commonly employed for holding the matches apart from each other, and the labour of arranging them in the frame is consequently avoided.

ABBOTT, JOSEPH, of Smallbrooke-street, manufacturer, and HENRY HOLLAND, of Steelhouse-lane, manufacturer, both of Birmingham. *Improvements in preventing the sinking of vessels at sea or on rivers, and in raising of sunken vessels.* Application dated January 19, 1855. (No. 147.)

This invention consists in adapting and applying to vessels air-tight bags of India-rubber or other suitable material, protected externally by strong net work, such bags being in communication with an air pump or machine by means of which they may be readily inflated.

LAURENT-PREFONTAINE, PIERRE CHARLES PAUL, of Paris, French Empire. *An improved engine, called hydraulic sling, for raising water and other liquids, or heavy bodies.* Application dated January 19, 1855. (No. 150.)

This engine or sling consists of a vertical vessel (by preference of a cylindrical form) open at both top and bottom. The bottom is placed in the liquid to be raised, and rotary motion round its axis is communicated to the vessel from some prime mover, the liquid being taken up at the bottom and delivered at the top.

PROVISIONAL PROTECTIONS.

Dated June 22, 1855.

1433. Simon Eugene Gabriel Simon, of Paris, France, gentleman. The use of a new material in the manufacture of paper.

Dated June 28, 1855.

1474. Christopher Jelinger Symons, of Here-

[redacted]

ford, Captain in the Bombay Army. Certain improvements in steam engines.

Dated July 3, 1855.

1498. William Hammant, of Standfield-street, Stepney, Middlesex, cabinet maker. A new apparatus for condensing smoke.

Dated July 9, 1855.

1534. Henry Crosley, of the Grove, Camberwell, Surrey, civil engineer. Improvements in projectiles and the manufacture thereof for ordnance cannon, rifles, muskets, and all descriptions of small arms, and also in the mode or modes of loading, using, and working the same.

Dated July 10, 1855.

1540. Emile Kopp, of Accrington, Lancaster, chemist. Improvements in mordants used in printing and dyeing.

Dated July 12, 1855.

1557. Benjamin Greening, of Manchester, wire-worker and machine-maker. Improvements in machinery for washing and mangling, parts of which are applicable to churning.

1559. John Bethell, of Parliament-street, Westminster, gentleman. Improvements in preserving meat, fish, fruits, and other eatables from decay, and for the purpose of their being used as provisions.

1561. Edwin Daniel Chattaway, of Edinburgh, Mid-Lothian, engineer. Improvements in buffing and coupling apparatus for railway carriages and rolling-stock.

1563. Edward Simons, of Birmingham, Warwick, manufacturer. A new or improved instrument or apparatus to be used for condensing and absorbing the smoke and products of combustion arising from gas and other flames, and increasing the illuminating power of the said flames.

1564. John Henry Weston, of Cross-street, Newington Butts, Surrey, gasfitter, and John Edmund Lewis, of Nicholas-street, New North-road, Middlesex, brass-finisher. Improvements in the construction of moderator-lamps.

1565. Romain Denis Obissier, of Rue St. François, Bordeaux, France, engineer. Improvements in obtaining motive power by hydraulic means.

Dated July 13, 1855.

1569. James Higgin, of Manchester, Lancaster, manufacturing chemist. Improvements in clearing and brightening dyed and printed fabrics.

1571. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in the manufacture of boots and shoes. A communication.

1573. Richard Hornsby, of Spittlegate Iron Works, Grantham, Lincoln. Improvements in thrashing-machines.

1575. Major Lawton, of Micklehurst, Chester, bookkeeper, and Thomas Schofield, of the same place, cotton-spinner. Improvements in machinery or apparatus for preparing, spinning, winding, and doubling cotton or other fibrous substances.

1577. Robert Yeates, of Trafalgar-place West, Hackney-road, Middlesex, cutler and surgical instrument-maker. Improvements applicable to the instruments termed "lock" knives and "lever" knives, part of said improvements being applicable also to such surgical and other instruments as may be connected to handles by moving joints.

1579. Robert Burns, of Liverpool, Lancaster, engineer. Improved teeth gear.

1581. Pierre Ignace Alexis Gaudin, of Skinner-street, Snow-hill, London. Improvements in baths used for photographic purposes.

1583. Louis Constant Joseph Peliesse, junior, and Charles Auguste Joseph Lengelée, of Ham, France. Improvements in the manufacture of encaustic matters.

Dated July 14, 1855.

1584. Joseph Jules Derrielj, mechanician, of Paris, France. Improvements in machines for manufacturing lozenges, wafers, or pastilles of pasty materials.

1585. Francis Hamilton, of Bolton-le-Moors, Lancaster, foreman. Improvements in adjusting the top cards or flats of certain carding engines.

1586. Thomas Sadlier, of Mulla Tullamore, King's County, esquire. An improvement in apparatus for heating liquids.

1587. Francis Burke, of Woodlands, Montserrat, British West Indies, gentleman. Improvements in obtaining or preparing the fibres of the plantain, banana, aloe, and other vegetables, for various manufacturing purposes.

1588. Edwin Senior Atkinson, of Knottingley, York, manufacturing chemist. Apparatus for condensing or absorbing muriatic acid gas from the furnaces or kilns used in the manufacture of sulphate of soda.

1589. John Foley Kealy, of Oxford-street, Middlesex, agricultural implement-maker. Improved machinery for the pulping of turnips and other vegetable substances.

Dated July 16, 1855.

1590. William Henry Tayler, of South-row, New-road, St. Pancras, Middlesex. Improvements in hermetically sealing preserve canisters and other vessels by means of a new arranged screw cap and fittings. A communication.

1591. Antoine Regazzoli, of Milan, Lombardy. Impelling railway-carriages up ascents. A communication from Dr. Joseph Grassi, of Milan.

1592. Ludovico Gavioli, professor of mechanics, of Modena. A new or improved musical instrument, called claviaccord.

1593. Jean Baptiste Pascal, of Lyons, France. Certain improvements in obtaining motive power.

1594. Joseph Henry Tuck, of Pall Mall, Middlesex, civil engineer. Improvements in blowing-apparatus, and other apparatus and engines in which air and other elastic fluids are used. A communication.

1595. James Newman, of Birmingham, Warwick, manufacturer, and William Whittle, of Smethwick, Stafford, engineer. Improvements in the manufacture of axles.

1596. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in vices. A communication.

1597. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved mechanism for operating the shuttles of looms. A communication.

Dated July 17, 1855.

1598. Pierre Laroche, of Saventhem, Belgium. Improvements in rotatory steam-engines.

1601. Scipion Salaville, of Paris, France, proprietor. An improved apparatus for airing and preserving grain, seeds, apples, potatoes, hops, and other similar articles in granaries, warehouses, and ships.

1602. William Jenner, of Southwark, Surrey. An improved beverage.

1603. Henry Samuel Bosse, of Claverhouse, Bleachfield, near Dundee. Improvements in the process of drying organic substances.

1604. Adam Burdess, of Old Station, Rugby, Warwick, engineer. Improvements in the construction of oil-feeders for lubricating machinery.

1605. Edwin Scragg, of the Albert Works, Buglawton, Congleton, Chester. Improvements in steam-engines.

1606. Henry Huthnance, of Stratford, Essex, engineer. An improved method of effecting the

combustion of coals as used in the production of heat.

1607. Edward Barry, of Soho-square, Middlesex, gentleman. An improvement in pianofortes, organs, seraphines, harmoniums, and other musical instruments played with a key-board similar to that of a pianoforte.

Dated July 18, 1855.

1610. Felix Hoyos, mechanician, of Paris, France. Improvements in roasting-spits.

1611. Thomas Almgill, of Busby, near Glasgow, Lanark, engraver. An improved mode of printing on calico and other fabrics and matters, and in machinery and apparatus to be employed therein.

1612. James Reilly, of Essex-bridge, Dublin, cooper. Improvements in bending or shaping iron hoops for casks.

1613. Charles Toye, of Gloucester-street, Queen-square, Middlesex, mechanic. Improvements in looms for weaving pile and terry fabrics.

1614. William Smith, of Aston, near Birmingham, Warwick, manufacturer. Improvements in the manufacture of steel-wire for musical instruments, sewing-needles, and other purposes.

1615. Thomas Trapp, of Mile-end, Middlesex, ship-owner. An improvement in connecting and disconnecting screw-propeller and other shafts. A communication.

1616. John Ellis, of Heckmondwicke, York, surgeon. Certain improvements in the process of manufacturing ammonia, charcoal, animal and vegetable naphtha.

1617. James Pollard, of the Woolwich-road, Bexley-heath, Kent. Improvements in the manufacture of gas.

1618. William Ball, of Ilkeston, Derby, and John Wilkins, of Nottingham. Improvements in the manufacture of warp fabrics.

1619. James King and John Holdsworth, of Moss Mill, Rochdale, Lancaster, cotton-spinners. Improvements in the manufacture of certain woven cotton fabrics.

1620. Auguste Edouard Loradoux Bellford, of Essex-street, Middlesex. A new or improved method of condensing vapours and smoke. A communication from professor Frederic Kuhlmann, of Lille, France.

1621. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in the valves and passages for effecting the induction and eduction of steam in steam engines. A communication.

1622. Vincent Scully, esquire, and Bennett Johns Haywood, gentleman, of Dublin. Improvements in the construction of cocks and taps.

1623. Vincent Scully, esquire, and Bennett Johns Heywood, gentleman, of Dublin. Improvements in the construction of locks and latches, and in keys for same.

Dated July 19, 1855.

1624. Robert Martin, of High-street, Reading, Berks, artist, and John Cowdery Martin, of Pullen's-row, Islington, Middlesex, naval architect. An improvement in obtaining pulp from wood.

1625. John Pretty Clarke, of Leicester, manufacturer of sewing-cotton. An improvement in the manufacture of metallic reels.

1626. Samuel Barlow Wright, of Parkfield Stone, Staffordshire, and Henry Thomas Green, of Moreton, Staffordshire. Improvements in the manufacture of bricks and tiles.

1627. James Gray Lawrie, of Glasgow, engineer. Improvements in steam engines.

1628. Piétro Bertinetti, of Rue de l'Echiquier, Paris, France, gentleman. A new safety projectile.

1629. David Fisken and Thomas Robert Hay Fisken, of Stockton-on-Tees, engineers. Improvements in transmitting steam or other power for the tillage of land by ploughs and other implements, as well as for other purposes, and machinery for applying the power so transmitted.

1630. Edward Augustus Ferryman, of Wadenhoe, near Oundle, Northampton, clerk. An improved churn.

1631. James Thompson, of Pin Mill, Manchester, manufacturer, and James Mills, of the same place, manager. Improvements in power looms.

1632. John Henry Woolbert, of Brussels, Belgium, merchant. Improvements in the preparation of extracts from madder, and in the application of the same directly to fabrics, in order to dye or colour them. Partly a communication.

1633. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in transmitting motive power, principally applicable to horse-mills. A communication from Joseph Pinet, of Abilly, France, machine-maker.

1634. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in apparatus for actuating railway breaks. A communication from Charles Bricogne, of Paris, France.

1635. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of reeds for weaving, and in the machinery or apparatus employed therein. A communication from Henry Victor Wacrenier, of Paris, France.

1636. Thomas Broadbent, junior, of Crawford-street, Middlesex, plumber, painter, and glazier. Improved apparatus for filtering liquids.

1637. Mathieu François Isoard, of Paris, France, engineer. Improvements in apparatus for generating steam, and for applying the same to motive-power purposes.

Dated July 20, 1855.

1640. Henry Duncan Preston Cunningham, of Gosport, Hants, Esq. Improvements in reefing sails.

1642. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for obtaining motive power, applicable also to the raising, forcing, and exhausting air and other fluids, and partly to the kneading or working of dough or other pastes. A communication from André Koechlin, Napoléon Joseph Vicomte Duchatet, and Joseph Antoine Auguste de Perpigna.

1644. George Conner, of Byrom-street, Liverpool, Lancaster, brush-manufacturer. An improvement in the manufacture of brushes.

1646. Casimir Deschamps and Charles Vilcoq, of Rue Richer, Paris. A free diving boat.

Dated July 21, 1855.

1652. Robert McLaren, of New Peckham, Surrey, licensed victualler, and Steven Williams Pugh, of Peckham, Surrey, manufacturing chemist. Improvements in the manufacture of artificial fuel and fire-lighters, and in moulds to be employed therein.

1654. Charles Goodyear, of Avenue-road, St. John's-wood, Middlesex. Improvements in the surfaces used for printing. Partly a communication.

1656. Anthony Dugdale, of Rue Ponthieu, Paris, France, engineer. An improvement in the construction of locomotive engines.

1660. William Edward Kenworthy, and Henry Greenwood, of Leeds, York. Improvements in the construction of screw propellers.

Dated July 23, 1855.

1662. Henry William Ripley, of Bradford, York, dyer. Improvements in dressing and finishing woven fabrics composed wholly or partly of wool. Partly a communication.

1664. Charles Goodyear, of Avenue-road, St. John's-wood, Middlesex. An improvement in

manufacturing moulded articles made of compounds of India-rubber. A communication.

1666. Charles Goodyear, of Avenue-road, St. John's-wood, Middlesex. Improvements in the manufacture of combs.

1668. Auguste Achard, of Chatte, near St. Marcellin, and Rue Neuve Coquenard, Paris, France, pupil of the Polytechnic School. Improvements in the application of electricity as a transmitting agent of motive power.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," August 8th, **1856.)**

667. Henry Charles Hill. Improvements in the manufacture of waterproof flocked cloth and other fabrics.

675. John Gedge. Improvements in the mode or modes of transferring designs on to woven, textile, or other fabrics, or on paper, and in the machinery used for such purposes. A communication.

682. John Shae Perring. Improvements in the permanent way of railways.

684. François Ettienne Hudde and Jean Baptiste Emmanuel Fouquet. Certain improvements in the construction of pyrometers.

695. François Joseph Anger. Improvements in the preservation of vegetable substances.

701. Alexander Dalgety. Improvements in steam engines.

702. John Henry Johnson. Improvements in anchors. A communication from Louis Frederic François David, of Havre, France.

704. William James. Improvements in the manufacture of screw-bolts.

708. William Swain. Certain improvements in furnaces for japanner's stoves, ovens, boilers, and kilns, and which improvements are also applicable to other fire-places, by which combustion is rendered more complete and the fuel thereby greatly economised.

719. John Bailey Surgey. Improvements in instruments for threading needles.

721. Robert Hardman. Certain improvements in looms for weaving.

727. Thomas Hedgcock. An improved quadrant for taking solar altitudes for latitude without aid of marine horizon, and for ascertaining the true longitude.

1729. Frederick Phillips. Improvements in machinery or apparatus for distributing manure, sowing or depositing seeds, and effecting the working and cultivation of land.

745. Louis Cornides. Certain improvements in saturating and coating or covering leather, paper, and textile fabrics, so as to render the same on the coated or covered surfaces thereof impervious to water.

759. James Chesterman. Improvements in the manufacture of table and other like knives.

774. Joseph Aresti. A method of obtaining improved effects from drawings washed or painted on stone.

782. William Bull. An improved instrument for cutting or slicing turnips and other vegetables.

786. Peter Armand Lecomte de Fontainemoreau. Certain improvements in the construction of steam boilers. A communication from Monsieur S. Boutigny, of Paris, France.

791. Lord Charles Beauclerk. Improvements in machinery for tilling and subsoil ploughing.

806. Soren Hjorth. An improved magneto-electric battery.

807. Soren Hjorth. An improved electro-magnetic machine.

808. Soren Hjorth. An improved electro-magnetic machine.

815. Jean Baptiste Bagary and Claude Perron. New or improved knitting-machinery.

823. George Turner. Certain improvements in the construction and fitting of tents and marquees.

853. John Kay. Improvements in preparing and printing textile fabrics and other surfaces.

970. Pierre Dépierre. Improvements in dyeing, part of which improvements is applicable to the manufacture of ink. A communication.

1147. James Shanks. Improvements in mowing-machines.

1148. John Henry Johnson. Improvements in signals for nautical purposes. A communication from Henry J. Rogers, of Baltimore, America.

1301. Moses Heap. Certain improvements in machinery or apparatus for grinding dye woods or roots, and for other similar pulverizing purposes.

1377. John Sellars. Improvements in the manufacture of starch, and in the use of substances employed therein.

1413. Uriah Lane. An improvement in the manufacture of pumps.

1452. Moses Poole. An improvement in sculpturing surfaces of marble and stone. A communication.

1476. Carl Christian Engström. Improvements in breech-loading ordnance, and the balls or projectiles thrown by cannon.

1540. Emile Kopp. Improvements in mordants used in printing and dyeing.

1547. James Hall Nalder. Improvements in winnowing or dressing grains and seeds.

1561. Edwin Daniel Chattaway. Improvements in buffing and coupling-apparatus for railway carriages and rolling stock.

1573. Richard Hornsby. Improvements in thrashing-machines.

1596. William Edward Newton. Improvements in vices. A communication.

1597. William Edward Newton. Improved mechanism for operating the shuttles of looms. A communication.

1599. William Pidding. Improvements in coverings for the feet of bipeds and quadrupeds.

1600. William Pidding. Improvements in the manufacture of building materials.

1601. Scipion Salaville. An improved apparatus for airing and preserving grain, seeds, apples, potatoes, hops, and other similar articles in granaries, warehouses, and ships.

1603. Henry Samuel Bosse. Improvements in the process of drying organic substances.

1612. James Reilly. Improvements in bending or shaping iron hoops for casks.

1614. William Smith. Improvements in the manufacture of steel-wire for musical instruments, sewing-needles, and other purposes.

1630. Edward Augustus Ferryman. An improved churn.

1632. John Henry Woolbert. Improvements in the preparation of extracts from madder, and in the application of the same directly to fabrics, in order to dye or colour them. Partly a communication.

1640. Henry Duncan Preston Cunningham. Improvements in reefing sails.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed July 27, 1855.

1045. George Taylor.
1079. François Alphonse Theroulde.
1123. Edmund Morewood and George Rogers.
1129. Henry How Watson and James Oliver.
1159. James Eden.
1163. Alfred Vincent Newton.
1207. Thomas Waterhouse.
1223. Daniel Dunn.

Sealed July 31, 1855.

245. Alexander Prince.
256. Robert James Maryon.
258. Edmund Clegg and James Leach.
270. John Imray.
272. Pierre Joseph Carré.
278. Frederick Gray.
298. Adolphe Girard.
390. Charles Low.
446. Thomas Cook.
474. William Johnson.
492. James Wood.
610. Vincent Scully and Bennett Johns Heywood.
618. William Smith.
642. John Henry Johnson.
1044. Duncan Morrison.
1094. John Lackmann.
1153. George Collier.
1304. John Andrus Reynolds.
1310. Peter Armand Lecomte de Fontainemoreau.
1316. Etienne Jules Lafond and Count Louis Alfred de Chatauvillard.
1326. Henry Bernoulli Barlow.

Sealed August 3, 1855.

37. Jean Baptiste Edouard Rüttre.
253. Frederick Samson Thomas and William Evans Tilley.
266. Alexander Morton.
274. Deane John Hoare.
296. William Hartfield.
308. William Beckett Johnson.
331. Auguste Vallery.
336. John Raphael Isaac.
346. Christophe François Delabarre.
407. Nathan Thompson, jun.
709. William Tytherleigh.
726. Elizabeth Abbott and Matilda Abbott.
905. John Orr and James Templeton.
963. James Marsh.
967. William Johnson.
1091. Robert Stirling Newall.
1140. Antoine Fidelis Cossus.
1141. William Longmaid and John Longbottom.
1142. Joseph Louis Rey and Adolphe Guibert.

CONTENTS OF THIS NUMBER.

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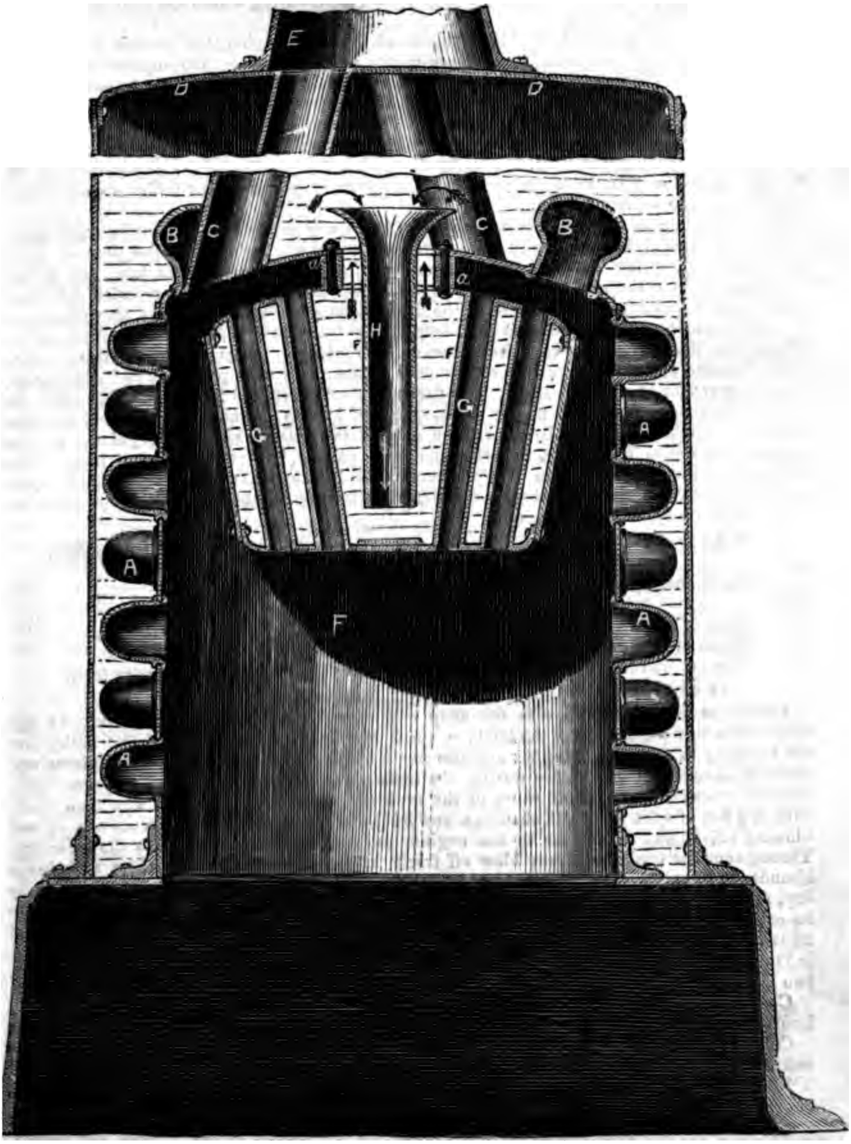
Edited by R. A. Brooman, 166, Fleet-street.

BARRANS' PATENT CUP-SURFACE BOILER.



BARRANS' PATENT CUP-SURFACE BOILER.

Our attention has recently been directed to an improved method of constructing steam boilers,—the invention of Mr. Barrans, of the manufactory of Messrs. R. and T. Hughes, Railway Foundry, Brighton Railway Station, New Cross,—from which results of an extraordinary character have been obtained. The main feature of the system consists in introducing into the fire-box plate a number of cups which project into the water-space, their concave surfaces being turned towards the interior of the fire-box. The effect of these cups is, in the first place, to increase considerably the extent of heating surface in contact with the water; and, in the second place, to prolong the time during which the heated gases are in contact with that surface.

In order to test the merits of this arrangement, Messrs. Hughes, the present proprietors of the patents, have had a number of experiments performed under the supervision of Mr. Daniel Kinnear Clark, whose skill in matters of this kind is well known to our readers. The results of these trials, as reported by Mr. Clark, are now before us. The first set of experiments was made with a small model locomotive boiler, and, after stating their details at length, he says, "Though the trials were few in number, and were made with a small model, the results elicited have, I believe, shown that the addition of the cup-surface in the fire-box added materially to the economical evaporative power of the boiler, as compared with that due to a plain fire-box."

The second set of experiments made by Mr. Clark was with a boiler upon the same principle as the model, but nominally of 12-horse power, which had been some time at work in London. The fire-box measured internally 2 feet 1 inch wide, 2 feet long, and 3 feet 1 inch deep, from the roof to the grate-bars. Ninety-two cylindrical cups, with spherical ends, were inserted in the four walls of the fire-box, at a pitch of 5½ inches; they measured 3 inches diameter inside, and 3¼ inches deep inside, from the outside of the fire-box plates. There were thirty-three tubes, 6 feet 4 inches long between plates; of which thirty tubes were 2 inches, and three were 1⅝ inch diameter inside: they were placed at 3⅝ inches pitch, or at a clearance of about 1¼ inch. The fire-box shell measured 2 feet 11 inches wide, by 2 feet 9 inches long outside; giving water-spaces of 4 to 4½ inches round the fire-box: the shell was finished cylindrically above, and carried the safety-valve and regulator on the crown; the barrel was 2 feet 6 inches diameter outside, by 5 feet 11 inches long. The safety-valve was screwed down to a pressure of 50 lbs. to the square inch. The fire-box surface measured inside, including the cups, and allowing for area subtracted by the tube-ends and doorway, 42·94 square feet.

Tube surface	108·15	square feet.
Total heating surface	151·09	,,
Area of grate	4·17	,,

Ratio of total heating surface to area of grate, 36¼ to 1.

The net increase of the fire-box surface due to the cups is 15·74 square feet, or 58 per cent.

The boiler was connected with the shop engine, which was worked exclusively by the steam from this boiler during the trial; a small blast-pipe being led from the boiler into the chimney to urge the draught; and the steam conveyed by it supplied a continuous and uniform draught upon the fire during the trial. The fuel used was ordinary gas coke. The boiler was filled with cold water to the ordinary water-level: the fire was then made with 17¼ lbs. of split wood and shavings, and 84 lbs. of coke. When the steam was up and blowing off, it was turned on to the engine, and, at the same time, into the chimney. Throughout the trial the steam blew off freely at the safety-valve, and there was always abundance of steam for the engine and the blast: it blew off clear, and apparently quite dry, and no symptoms of priming could be observed. Converting the 17¼ lbs. of wood into its equivalent of ⅓ weight of coke; or, say 6 lbs. of coke, and deducting an allowance of 21 lbs. of coke for getting up the steam, the following are the results of the trial:

Duration of the experiment from the time the steam was got up till the fire was drawn, two hours thirty-three minutes.

Consumption of coke, 305 lbs.—119·6 per hour—28·68 lbs. per square foot of grate per hour.

Consumption of water, 304 gallons, or 3,040 lbs.—1,192 lbs. per hour—10 lbs. per lb. of coke.

From this statement it appears that above 28 lbs. of coke were consumed per square foot of grate per hour; and that, at this rate of combustion, 10 lbs. of water were consumed per pound of coke. "This result," says Mr. Clark, in his report, "considering the propor-

tions of the boiler and the quality of the coke (ordinary gas coke), compares most favourably with any that have been derived from locomotive boilers, that have come under my observation. The ratio of heating surface to area of fire-grate was, in the boiler under trial, 36¼ to 1: that is, 36¼ square feet of heating surface for each square foot of grate; this is certainly a high ratio of surface compared with that of ordinary stationary boilers, but it is very low compared with that of ordinary locomotive boilers. Now an ordinary locomotive, so far as I can judge from my observations, would require not less than 45 square feet of heating surface per foot of fire-grate to consume the same quantity of fuel per foot of grate with the same evaporative efficiency: it would appear, therefore, that 36 feet of surface has done as much in the boiler under trial as 45 feet of surface would do in ordinary locomotive boilers with the same proportion of fire-grate—that, in short, one-fifth, or twenty per cent. of heating surface required in an ordinary locomotive boiler is saved in the boiler experimented on, constructed by Mr. Barrans.

"Without wishing to assign to the cup-surface arrangement any *specific* amount of the superiority in the boiler under trial, I must observe that the favourable impression created by the trials of the small model boiler which were detailed in my report to you, remains undiminished; and I am still of opinion that the economical evaporative power of Barrans' boiler is materially increased by the addition of the cup-surface to the fire-box, as compared with the performance due to a plain fire-box."

Very recently we have ourselves tested the power of an upright cylindrical boiler constructed on the same principle, and obtained results of a striking character. This boiler, of which a shortened vertical section is given on the front page of this Number, is furnished with 64 cups, A A, inserted all round the fire-box plate, and with six others, B B, of a somewhat different form, fitted into the crown of the fire-box.* Into the fire-box crown are also inserted three flue-pipes, C C, (two only of which are shown in the section,) which pass thence through the water and steam spaces above, forming a triangle, their upper ends meeting at the top of the boiler-shell, D D, where they enter an iron chimney, E, which is bolted down to the shell. This boiler also contains a water-chamber, F F, suspended over the fire from the crown of the fire-box, by means of screw-bolts, *a a*. This chamber is a few inches less in circumference than the fire-box, and the same distance below the crown, thus allowing the heat to play all around it, and also affording access to the cups opposite to and above it. It is furnished with flue-tubes, G G, through which the gases pass directly to the crown of the fire-box, and to the cups, B B, inserted in it. These tubes are of course surrounded by the water in the chamber. A copper pipe, H, 2½ inches in diameter, and spreading out into a trumpet mouth at its upper extremity, passes through the crown of the fire-box, and extends into and through the crown of the water-chamber, F F, its upper end standing in the water space of the boiler from one to two inches above the crown of the fire-box, and its lower end reaching to within two inches of the bottom of the chamber, F F. By means of this pipe, H, the water in the boiler and chamber is caused to circulate in the direction of the arrows, whilst the steam formed in the chamber ascends with the water, and passes into the steam space above.

In our trial of the evaporative power of this boiler, the fire was lighted with 3 lbs. of shavings, 10 lbs. of split wood, and 40 lbs. of ordinary gas-coke, at 6 minutes past 11 o'clock, with the feed water at 62°, and the safety-valve screwed down to 40 lbs; at 36 minutes past 11 steam was blown off. The valve was then screwed down to 60 lbs., and the steam blew off at 38¾ minutes past 11; the valve was then screwed down to 70 lbs., and the steam again blew off at 39¼ minutes past 11. Thus from water of 62° steam of 40 lbs. pressure was generated in 30 minutes; steam of 60 lbs. in 32¾ minutes; and steam of 70 lbs. in 33¼ minutes. The fire was then levelled, and the quantity of fuel supplied, and water evaporated during the two following hours measured. During that period the weight of the coke consumed was 80 lbs., and that of the water evaporated 980 lbs. (98 gallons); thus each pound of coke was found to evaporate into steam of 70 lbs. 12·25 lbs. of water at 62°, while in the most careful laboratory experiments, 1 lb. of pure coke is found to evaporate no more than 12·4 lbs. of water at 68° into steam of 30 lbs. This result, which indicates that in the boiler under trial more than 98·7 per cent. of the whole heat produced by the combustion of the coke was transmitted to the water, is certainly of a very important character, and proves that Mr. Barrans' arrangement is a very valuable one. Throughout the trial the steam blew off freely and dry, and no priming whatever could be observed.†

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* The fire-box measured internally (in the clear) 1 foot 8½ inches wide, 1 foot 5 inches to the bottom of the chamber, F, and 2 feet 6 inches to the crown of the fire-box, measuring from the grate-bars in both the latter cases. The water-space between the fire-box and the shell of the boiler was 4 inches wide.

† We paid particular attention to the height of the water in the gauge, and of the level of the fire, at the commencement and conclusion of the two hours' trial, and are confident that they were so nearly alike in both cases that we could observe no difference. It should also be stated that the boiler was not fitted with a jacket, and must, on that account, have sustained some loss of heat.

Having thus stated the nature of this invention, and laid the results of our observations before our readers, it only remains for us to add, that Messrs. Hughes are manufacturing boilers of a similar construction for a great variety of purposes; among others, for use in marine engines, and also for agricultural purposes. In fact, a boiler of the description represented in the engraving, mounted on a pair of wheels, and fitted with a compact engine, would make a most effective and economical agricultural machine, weighing in all but little more than 21 cwt., and capable of being moved with facility by a single horse, or even by manual power. A similar arrangement would be useful for many other purposes which will suggest themselves to engineers and others.

ROUGH NOTES ABOUT OCEAN STEAMERS.

BY T. PROSSER, C.E., NEW YORK.

PART I.

The American Legend of the "Savannah."

THE *Savannah* is the name of a vessel which many persons suppose to have been the first steamer that ever crossed the Atlantic. For some years past it has been a sort of stalking horse with the New York and other papers whenever short of news, to bring forward, and generally with such additions and amplifications, that it may ere long become as much a myth as "Mrs. Harris," of Dickens, and people may imagine that there never was a *Savannah* at all. To prevent that, and also to put the matter in an authentic shape, is the object of this paper; to which I shall add some observations, from authentic sources, in reference to other vessels propelled by steam at an early period of steam navigation.

"The commander of the British fleet," lying at Liverpool, as we are informed, "was utterly at a loss to account for her remarkable appearance, enveloped as she was in heavy smoke, and moving without the aid of canvas, he naturally conjectured she must be on fire."

This extraordinary statement refers to the *Savannah*, on her arrival at the port of Liverpool, in the year of our Lord, 1819,[1] May 20th, from Savannah, in 26 days. The *Savannah* was built and owned at Savannah, and she sailed from that port, and not from New York as is generally stated; she had been to New York, however, to have her engine and boiler, as well as her paddle-wheels put on board. I have the authority of a gentleman,[2] who knew Captain Rogers very well, boarded at the same house with him, at the close of the year 1818, and was frequently with him on board the vessel, for saying, that she was a handsome craft, and a full-rigged ship, and by no means small as compared with other vessels at that time, but that she had very little of the appearance of a steam ship and probably went to Savannah with pine wood to raise steam, if she did steam there, as he saw much about. A merchant[3] in Liverpool informed me, from his own recollection and that of others, that the only surprise created by the appearance of the *Savannah* was, her hermaphrodite character, and had she gone up to Cork, as some of the accounts have stated that she did, the Corkonians would doubtless have been equally astonished, as the same account informs us they were; but this must be a mistake, for, William Goodman, Esq.,[4] expressly says, "It is a pity" (and "so it is," as Hotspur says) "she did not put into Cork Harbour," which, of course, he would not have said if she had done so; but the fact is, she was never probably nearer than within 20 or 30 miles off Cork.

We may now easily imagine that the "British Admiral" really did mistake her for a ship on fire, and send to offer her assistance; but the object of the paragraph first quoted, is evidently intended to make it appear that he did not know a steamer from a "ship on fire." At this very time, the *Ætna*,[5] a double vessel of 75 tons burden and 20 horse-power, built at Liverpool by Fawcet and Littledale, had been running as a ferry boat from that port across the Mersey some two or three years before. The *Rob Roy*, in 1818, plied between Glasgow and Belfast as a regular sea-going steamer. The *Mersey*[6] and the *Robert Bruce*, too, were at Liverpool, and everywhere in England, Ireland, Scotland and Wales, the steam boat was well known previous to the arrival of the *Savannah*. Nay, more, several steamers had been built and sent across the Atlantic, and up the St. Lawrence, as well as to various other foreign parts. Altogether, more than 60 steam boats had then been

[1] The *Talbot* plied daily at this time between Holyhead and Dublin.—Fifth Report on the Roads *from London* to Holyhead—"Steam boats"—1822, *page 118.*

[2] *Thomas Woodward, Esq., of Brooklyn.*

[3] Thomas B. Blackburne, Esq., of Liverpool.

[4] Author of the "Social History of Great Britain," "Hunt's Mer. Mag.," vol. xv., page 611.—New York, December, 1846.

[5] Fifth Report on the Roads from London to Holyhead, 1822—"Steam boats"—appendix, page 198.

[6] Fifth Report ditto, pages 118 and 198.

built, commencing with the *Comet* and *Elizabeth*, in 1812, and ending with the *Mersey*, in the early part of 1819. The *Margery*, the *Lady of the Lake*, and the *Caledonia*, were built in 1813, 1814, and 1815, and in 1816, the two first were respectively on the rivers Seine, in France, and the Elbe, in Germany; while the latter,[7] in 1818, was running as a summer-passage boat between Copenhagen and Keil. She had *previously* been to Holland and up the Rhine to Coblentz, and Mr. Watt himself was on board, as he informs us. A fearful proof of the existence of English steam boats in 1816, was the explosion of the *Phœnix*[8] (built in 1814), by which nine persons were killed at Norwich. A French writer, quoted by Hunt,[9] says, that

"In 1817, there were 14 steam vessels *running*."

"Nine persons perished in this[10] year.

"1818, 19 steamers; no accident.

"1819, 24 ditto ditto:"

This account is far short of the truth, but quite sufficient for my purpose.

Mr. Watt in his evidence before referred to, states, that the first steam-boat engine built by his firm was made[11] "for the late Mr. Fulton, of New York, in 1804, and used in his first-passage boat on the Hudson River in 1806—7, and the first *two* engines having the *cranks working at right angles to each other*,[12] was for a boat upon the River Clyde, in 1813.

"We have made a considerable number," he says, "for the River St. Lawrence, for rivers in Great Britain, and on the Continent," &c. In 1817 we fitted up the *Caledonia*, a Clyde built vessel, which I have before referred to, and excepting that one, none of them are included in the 60 built up to the early part of 1819.

The *Congo* was built in 1816, for the Congo expedition, and the *Rising Star* in 1818, for South America; but I do not know what became of them. Sir John Ross,[13] however, in his "Treatise on Navigation by Steam," 1837, page 124, says, that "The vessel which first crossed the Atlantic made a longer passage than has often been made by sailing vessels, and her engine was only at work 19 hours."

Now this could not refer to the *Savannah*, and as the *Rising Star* is known to have gone to South America, as reported by the builders,[14] Messrs. Maudslay and Field, Sir John may possibly refer to her.

The discrepancies in relation to the *Savannah* are quite unaccountable. She has generally been stated to have sailed from New York by Partington,[15] Woodcroft,[16] Tredgold and Renwick.[17] William Goodman and Junius Smith[18] alone state correctly from Savannah, but Mr. Rush says nothing whatever upon that point. Her tonnage has been variously stated at 200,[19] over 300, and 250,[20] the time occupied by the voyage at twenty-two and twenty-six days, and the power of her engines at 70 and 72 horse-power, while the years 1817, 1818, and 1819,[21] have all been given as the year of her exploit. One account says that she was 18,[22] and another six or seven days[23] under steam. Partington says, "that the *Savannah* had an axle-tree of cast-iron passing through her sides, above the bends, attached to which were two cast-iron arms," which could be placed horizontally. Junius Smith says,[24] "that the *Savannah's* pretensions were not obtruded upon the public notice" until the year 1838. That she was not "built as an ocean steamer," did not, and could not, "cross the Atlantic by steam." That "she was constructed with a view of selling her to the Emperor of Russia." When that enterprise failed of success, her career as a steam vessel terminated.

This agrees with other accounts, and also with the one given by Partington, and, in

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[7] Fifth Report on the Roads from London to Holyhead, 1822—"Steam boats"—appendix, page 210.—James Watt's letter.

[8] Fifth Report, ditto, ditto, page 198.

[9] "Hunt's Mer. Mag.," vol. xiv., page 378, 1841.

[10] Fifth Report, &c., page 198. States, 1816.

[11] Fifth Report, &c., "Steam boats," appendix, page 210.

[12] And yet Mr. Francis B. Ogden has the credit of "having originated the idea" in an Ericcsson lecture of John A. Sargent, delivered in 1843, on "The Caloric Engines," remarkable only for the quotation of the stilted rubbish of such an author as Mr. Bennett Woodcroft, page 91, "On Steam Navigation." This mode of connecting engines was not new in 1813, except as applied to steam boats. I do not know of anything earlier than a pair of engines erected by Boulton and Watt for Osborne and Grimby, to drive a rolling mill near Birmingham, probably about 1806. These engines were erected under the superintendence of Mr. Robert Potter; and he used to say that the idea and execution of the plan of putting them to work at right angles to each other originated with himself.

[13] Sir John Ross, "Treatise on Navigation by Steam," 1837, page 124.

[14] Fifth Report, appendix, pages 199 and 211.

[15] Partington, as quoted by Bennett Woodcroft in his Treatise.

[16] On Steam Navigation, page 87; also Renwick in appendix to.

[17] Tredgold "On the Steam Engine," page 113, and in his own Treatise on the same, pages 269 and 271.

[18] Hunt's "Mer. Mag.," vol. xv., page 611, and vol. xvi., page 172.

[19] Hunt's "Mer. Mag.," vol. xv., page 611; vol. xvi., page 172.

[20] Rush, page 130; Woodcroft, page 87.

[21] Renwick, pages 269 and 271; Rush, page 130.

[22] Rush, page 130.

[23] Woodcroft, page 87; from Partington, page 60.

[24] Hunt's "Mer. Mag.," vol. xvi., page 172.

fact, on her return, her whole steam apparatus was taken out. Junius Smith went on board of her in Liverpool soon after her arrival there, and very naively observes, "at that time I had not the slightest idea of navigating the ocean by steam."

In Rush's "Residence at the Court of London," published in 1845,[25] Captain Rogers himself informed the Ambassador, July 3, 1819, that he arrived at Liverpool, June 20, of that year, that his vessel was of above 300 tons burden, and used her steam full 18[26] days out of the 26, of which five were in the Irish channel. He had laid in 1,500 bushels of coal, and her engine was 72 horse-power. Her wheels were removable at pleasure.

Now, if she was full 18 days under steam, and five days at the entrance of the Irish channel before she obtained more coal, how long did it take her to get to Liverpool (about 300 miles further) after that time —and is that time included in the 26 days? If so, she could have been under sail but about part of a day, which is contrary to all the evidence in the case, and possibilities founded thereupon. The only way of reconciling this discrepancy, is by the supposition that the 18 is an error, and that eight days was the time during which she was under steam.

The *Savannah* then comes out—firstly, as a full-rigged ship when she arrived at New York, to have temporary side wheels, engine and boiler put into her; and, secondly, as a steamer in case of need; for it is rather too much to say, that she was both at one and the same time, in such "very unfavourable weather,"[27] as the Captain reported. Partington calculated her consumption at 10 tons per day, which would give her five or six days of fuel only; but one of her officers stated, "from recollection, that she steamed but seven or eight days." The only reasonable conclusion, therefore, that can be arrived at, is, that the *Savannah* was a steamer for about six or eight days, out of not less than 26 days, and that during the remainder of the voyage she was not a steamer at all, for she had no steam on her, nor had she the fuel to raise it; and if the steam had been raised, she could not have used it, for her paddle-wheels, like the engine and boiler, were merely on freight during three-fourths of the voyage at the very least.

Is it not, moreover, a little singular that the *Savannah* is nowhere mentioned in the "Fifth Report on Roads and Steam Boats, 1822," by Jacob Perkins,[28] in his evidence before a Committee of the House of Commons, although the questions proposed were just of such a character as would have brought her out? His evidence,[29] however (by letter), is very full and interesting in all particulars regarding American steam navigation, and may be read with much interest even now, as exhibiting the vast energy of the American people (of which he was no inferior type) in introducing steam boats upon their rivers, lakes, and coasts.

In the words of William Goodman, Esq.,[30] "It is due 'to historic truth, to science, and to navigation,' that the foregoing facts be duly recorded; facts which, doubtless, he was not acquainted with."[31]

I have now done with the *Savannah*; but inasmuch as the investigation of her claims has opened up other facts not generally known, and which, I think, may be of some interest to others, I will proceed to narrate them.

PART II.

The Paddle-wheel Era of Ocean Navigation by Steam.

The *Rob Roy*[32] has before been recorded as the first regular sea-going steamer in Great Britain, in 1818, and afterwards she went to France; from that date the course of ocean steamers was onward and upward. At the date of the "Fifth Report,"[33] hereinbefore referred to, steam boats were commonly employed in the Post Office service, to communicate between Great Britain and the Continent of Europe.

The first vessel which went out to India,[34] partly under steam, was the *Falcon*, in 1825. She was a barque, and had been previously "a yacht belonging to the Hon. Mr. Pelham, now Lord Yarborough;" she was furnished with paddle wheels and steam apparatus. In fact, she was the very counterpart of the *Savannah*; like her, too, she steamed some and sailed the rest—by far the greater part of her voyage. On her arrival at Calcutta, she was bought up by the Government; her engines were withdrawn, and she became a mere sailing vessel, as she was before; as also did the *Savannah*, before she ended her career, a wreck upon Long Island, New York.

The *Enterprize*[35] followed in 1826 to

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[25] *Rush, page 130; published in 1845.*

[26] *Rush, page 131.*

[27] *Rush, page 131.*

[28] *Fifth Report, page 206.*

[29] Fifth Report, page 237.

[30] Hunt's "Mer. Mag.," vol. xv., page 611.

[31] Another fact may as well be recorded here, which is, that the aforesaid W. Goodman is quite mistaken in saying, as he does, that "Her log is still in existence, I believe, in the Museum of the Patent-office, Washington," for no such document is there.

[32] Fifth Report, pages 115 and 198.

[33] Fifth Report, 1822, June 12th.

[34] "Civil Engineers' and Architects' Journal," vol. 1, page 262.

[35] July 1838, from "Nautilus" in the "Shipping Gazette."

[redacted]

India, and occupied over three months in reaching Calcutta, "hugging the African shores, touching at the Cape of Good Hope for coals;" she, too, was bought up by the Government, and, being a regular built steamer, has done good service. She was of 500 tons burden, and registered 17th of July, 1826,[36] as 149 feet 5 inches long by 26 feet 6 inches in breadth and 318 tons burden, exclusive of her engine-room.

The *Hugh Lindsay*[37] was built in 1829, and left Bombay 20th March, 1830, arriving at Suez 22nd April, of the same year.

Sir John Malcom, Governor of Bombay, had long entertained the idea of establishing a steam conveyance between Bombay and England, *vid* the Red Sea, Suez, and Alexandria. This vessel was the result; she was 411 tons burden, and had two engines of 80 horse-power each, and cost £40,000. She appears to have been the first sea-going steamer that ever made a long sea voyage entirely by steam, viz., that part of her voyage from Bombay to Aden, a distance of 1,710 miles, which she accomplished in eleven days, although, by some unaccountable blunder, she was calculated to carry but five days' fuel.

The *Atlanta*[38] comes next in order, but she is a vessel of a very different character to her predecessors, of 620 tons[39] burden, and 210 horse-power in two engines, built by Messrs. Maudslay. She steamed the whole way[40] against the south-east trade wind from Fernando-Po to the Cape, which is 2,400[41] nautical miles (the greatest run that had ever been made by a steam vessel at sea) in 14 days, and had then coals to spare. The *Berenice*[42] engines, by Napier, of Glasgow, was the mate to the *Atlanta*, but somewhat larger, being 680[43] tons measurement, and 230 horse-power. She steamed from Falmouth[44] to Mayo, a distance of 2270[45] miles (and had coals left) in 11 days 16 hours.[46]

The next ocean steamer worthy of special record is the *Great Western*;[47] she left Bristol, 8th April, 1838, and arrived at New York, April 23rd of that year. This first passage was of 14½ days duration. The average of her passages from New York to Bristol to July, 1839, was 13¾ days. The shortest was 12½ days, and the longest was 15 days. From Bristol to New York, 16½ days average; the shortest, 13 days, and the longest, 21½ days. The average of all the passages, out and home, was 15 days.

The *Great Western* was the first vessel that ever left England and steamed across the Atlantic without touching at any intermediate port.

This memoranda of record of ocean steaming covers a period of 20 years, from the *Rob Roy* in 1818, to the *Great Western* in 1838.

PART III.

The Iron Ship and Screw Propeller Era.

In seven years later, viz., 26th July, 1845,[48] the iron screw steamer, *Great Britain*, commenced her career, and a new era in ocean steam navigation. She arrived at New York from Liverpool, 10th August, 1845; and this century, which saw the birth of ocean paddle-wheel steamers, is probably destined to see the last of them dependent upon their wheels alone.

Next and last comes the *Himalaya*,[49] the largest iron screw steamer in the world. The last exploit of this noble vessel was to convey 418 troops and 372 horses from Liverpool to Constantinople, a distance of 3,620 miles in a little over 12 days (one horse only, and not a man at all died on the passage). She left Liverpool at 6 h. 30 m. A.M., July 26th, 1854, and arrived at Malta at midnight, August 3rd, 2,660 miles in 209½ hours, or 13¼ miles per hour.

She accomplished the distance of 1,226 miles in 101½ hours from Liverpool to Cape St. Vincent=12 m. per hour; 1,195 miles in 61 hours from Gibraltar to Malta =19¾ m. per hour; 239 miles in 47 hours. She partly lay to from stress of weather between Cape St. Vincent and Gibraltar. The distance of 960 miles from Malta to Constantinople was run between midnight of August 3, and some time of the day of August 7.

The *Simla* is said to be her equal.

If war alone can civilize barbarians, it is by the aid of such vessels alone that it can be carried on.

Extract from the "Times," 5th July, 1848.

WOOLWICH, *July 5th.*—The *Minx* steam-

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[36] Return—House of Commons on Steam-vessels, May 1, 1851.

[37] "Civil Engineers' and Architects' Journal," vol. 1, page 262; and "Report on Steam Communication with India,"—House of Commons, 15th July, 1837, page 5, 233; and "Journal of Franklin Institute," 1831, vol. 7, page 139, (from the "United Service, Journal.")

[38] House of Commons' Report on Steam Communication with India, 15th July, 1837. Qy. No. 516, page 40.

[39] Qy. No. 506.

[40] Qy. No. 512.

[41] Qy. No. 516.

[42] Tredgold, page 471.

[43] Report, 15th July, 1837.

[44] Qy. No. 508.

[45] Qy. No. 538.

[46] Tredgold, page 471.

[47] Hunt's "Mer. Mag.," New York, 1839, vol. 1, page 180.

[48] Hunt's "Mer. Mag.," vol. 13, page 252.

[49] Hunt's "Mer. Mag.," vol. 31, page 382.

vessel, one hundred horse-power, went down the river last week, with thirteen different modifications of screw propellers, for which she is fitted, one shipped, and the others to be tested, to ascertain their relative qualities in giving speed to the vessel. Mr. Trickett, First Assistant-Inspector of Steam Machinery at Woolwich Dockyard, attended on board to test the various screw propellers, and the whole thirteen were tried with the greatest care, as many as thirty passages being made in one day up and down the measured mile at Long Reach, commencing the trials at four o'clock in the morning, and continuing them until dusk on Thursday, Friday, and Saturday last. The result of the repeated trials was in favour of a form of screw propeller submitted by Mr. Woodcroft, and slightly altered on the suggestion of Mr. Atherton, Chief Engineer and Inspector of Steam Machinery at Woolwich Dockyard,—Woodcroft's screw having propelled the *Minx* at the rate of 9 knots per hour; and, when at its greatest velocity, the engines performed about three revolutions per minute less than with any of the other screws.

NOTE.—For the specification of this patent the reader is referred to the "Repertory of Arts," vol. vii. (enlarged series), page 293; "London Journal," vol. i. (conjoined series), page 349; "Register of Arts," vol. vii. (new series), page 295.

WHITWORTH'S PATENT ORDNANCE AND RIFLES.

IN fulfilment of the announcement made on pages 593 of our last, and 54 of our current volume, (Nos. 1663 and 1667), we now lay before our readers a description of the improvements in cannons, guns, and fire-arms for which Mr. J. Whitworth, of Manchester, has recently obtained letters patent, dated December 1, 1854.

The invention consists, firstly, in constructing cannons, guns, and the barrels of fire-arms, in separate parts, and uniting together, by means of hoops or belts, two or more segments made of a particular shape (as hereinafter described), which when so united form a cannon or other piece of ordnance, or the barrel of a fire-arm, the interior of which may be rifled, not by boring and cutting grooves in it, as in the ordinary mode, but by making the interior in the form of a hollow polygonal spiral or screw of the requisite pitch and number of threads. The spiral figure adopted may have any number of sides, as may be found most suitable to the size of the piece; for an ordinary rifle it has been found advantageous *to employ* from six to eight sides, and for a twelve-pounder cannon nine sides, as shown in the engravings. Great accuracy is required in making the segments, as each should be the exact counterpart of another; the surfaces of their edges intended to be brought in contact must be perfectly true, and be so shaped that the lines of junction in every case shall follow the course of the spiral, and bisect at every point one of the angles of the hollow spiral figure formed by all the segments when united. Their exterior surfaces may correspond in shape to the interior, or may be circular, so as to form when hooped together a conical surface tapering from the breech to the muzzle. The inner surfaces of the hoops or belts for uniting the segments will correspond with the outer surface of the segments on which they are fitted. The said hoops or belts may be made of any required breadth the most economical, and may be forced on the segments, so as to produce the requisite degree of tightness by a screw at the muzzle. The breech is formed by screwing a cap on the breech end of the segments which is pierced for the touch-hole, and the trunnions are attached to one of the hoops or belts. The different parts of the cannon or gun barrel may be made of different materials; thus, the segments may be of cast or wrought-iron, or of wrought-iron and steel, or other suitable metal, and the hoops or belts may be of malleable iron or other metal, according as the quality of a particular metal in point of hardness or strength renders its employment desirable for a special purpose, as to withstand friction or resist a great strain. A second series of belts may be used outside the others for giving additional strength. These may be made of comparatively thin steel, and being put on hot would adjust themselves, and prevent the necessity of boring and turning.

"By this method of constructing cannon or barrels of fire-arms in segments, it is obvious," says Mr. Whitworth, "that the material will be comparatively easily dealt with, while the requisite accuracy may be attained in shaping the segments. It is necessary that the segments should contain a sufficient mass to give the piece solidity and steadiness in firing; at the same time it will be found, if the hoops or belts be made of a malleable metal, that it will yield to great pressure. The danger of a gun bursting from an overcharge of gunpowder will be obviated, because the strain will be distributed throughout the length of the segments, and by forcing the hoops or belts to give way cause the joints of the segments to open longitudinally, thus acting as safety valves, allowing the gases generated by the explosion to escape through the joints so opened. The piece may be spoiled by over-

[redacted]

straining the parts, but its liability to burst will be prevented. In the case of heavy pieces of ordnance the facilities of transport are much increased, as by removing the hoops or belts the various parts may be disconnected and transported separately."

The patentee proposes to cast the barrel in one piece, and to cut a slit or slits along the angles, following the spiral course of the groove, the slit or slits to be filled by wedge pieces inserted from the outside, to which, if made thin, the spiral shape can be given them in a heated state. Up to a limited size of cannon this mode of construction might be desirable for the sake of economy, as it also allows of the adoption of wrought-iron hoops in combination with the cast-iron or other metal, as in the case of the segments before referred to. When it is important that the weight in a small cannon or fire-arm should be diminished, instead of constructing them in segments, as above described, the patentee finds it more convenient to make the tubular part in one piece, giving to its interior, however, the spiral figure, as before described, when segments were employed. He makes the exterior to taper from the breech to the muzzle either of the ordinary conical figure, or of a spiral angular figure, corresponding with the figure of the interior, so that in any transverse section there is uniformity of thickness and strength of metal. In the case of cannons so constructed, the trunnions are cast on, and the piece made open at both ends, to facilitate the operation of the tool employed in shaping the interior; and when the cannon or fire-arms are made breech-loading, a cap is screwed on to form the breech, in the manner hereinafter described; when they are made to load at the muzzle, the breech is screwed in. It is to be observed that it has been found desirable to employ for the improved ordnance and fire-arms projectiles specially adapted to them (for which Mr. Whitworth obtained provisional protection on the 23rd April, 1855, and which we shall hereafter describe), being partly conical in shape, but having in the part which is in contact with the barrel, spiral lines and surfaces cut upon them so that they exactly fit its interior. The description of the improvements will be fully understood by referring to the engravings.

Fig. 1.

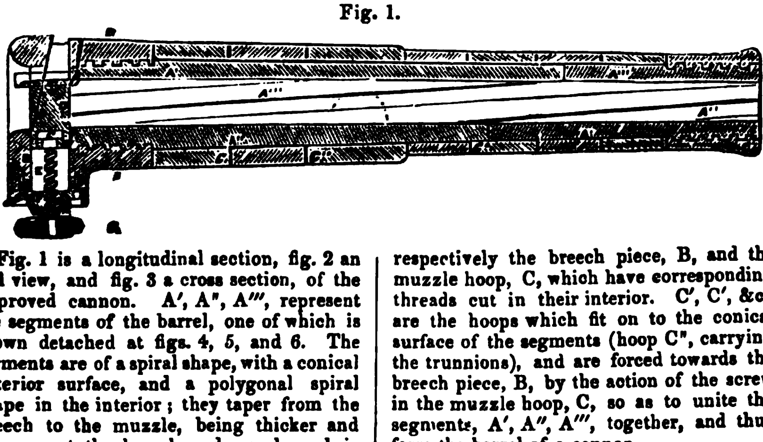


Fig. 1 is a longitudinal section, fig. 2 an end view, and fig. 3 a cross section, of the improved cannon. A′, A″, A‴, represent the segments of the barrel, one of which is shown detached at figs. 4, 5, and 6. The segments are of a spiral shape, with a conical exterior surface, and a polygonal spiral shape in the interior; they taper from the breech to the muzzle, being thicker and stronger at the breech end; each end is provided with a screw, screwed to receive respectively the breech piece, B, and the muzzle hoop, C, which have corresponding threads cut in their interior. C′, C′, &c., are the hoops which fit on to the conical surface of the segments (hoop C″, carrying the trunnions), and are forced towards the breech piece, B, by the action of the screw in the muzzle hoop, C, so as to unite the segments, A′, A″, A‴, together, and thus form the barrel of a cannon.

Fig. 2.

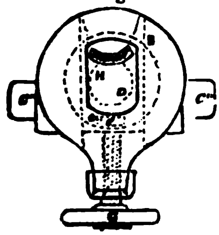


Fig. 3.

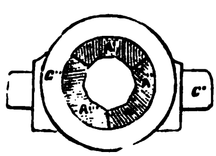
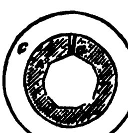


Fig. 7.

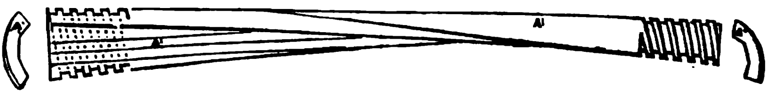


The improved mode of constructing cannons with a cast-iron barrel in one piece, having a slit cut through it, is shown in section, fig. 7, in which A is the barrel,

having a bore similar to that already described, and a slit through one of its angles, which follows the spiral course of the interior. *a* is a thin segment of metal, which is inserted in the slit from the outside: C is one of the hoops, which are similar to those shown in fig. 1.

The improved apparatus for breech loading consists of the wedge piece, D D, which takes into a suitable opening or slot in the

Fig. 4. Fig 5. Fig. 6.



breech piece, B B, and has at its upper end a steel piece, *b*, fitted into it. The side of the wedge piece, D D, next to the barrel, has a surface perpendicular to the axis of the barrel, whilst the surface on its opposite side is inclined to it at a small angle. E E is a screw of coarse pitch, having a collar, *c c*, at its upper end, which fits into a recess in the wedge piece, D D, and is retained therein by the bush, *d d*, and pins, *e e*; the end of screw, E E, passes through the nut, F F, and has a hand wheel, G G, by which it is turned. The nut, F F, is fastened to the breech piece, B B, by the screws, *f f*. H H is an opening formed in the breech piece, B, through which the cartridge or charge is passed to the barrel, the wedge piece, D D, being previously withdrawn by the screw, E E; the wedge piece is then forced up against the inclined edge of the breech piece, B B, and its front surface is brought into close fitting contact with the end of the barrel. In its passage upwards, the steel piece, *b*, may be used to cut off the end of the cartridge if desired, or it may be provided with a cutter for that purpose, having a projecting ledge to prevent the powder or dust from falling.

The same principle the patentee applies to rifles. The cross section of the barrel at any part exhibits externally the same polygonal outline as internally, and, viewed longitudinally, has similar spiral lines and surfaces to the interior; it tapers from the breech to the muzzle. The breech piece is screwed on to the end of the barrel, and attached to the stock of the gun by a tail piece and screws. The breech piece has a vertical slot or opening, into which is fitted a wedge piece and screw, as described in the case of the cannon. The cartridge or charge is inserted in the manner described above in treating of the breech-loading of cannon. The fire-arm cannot be discharged until the wedge piece is raised to its proper position, as in any other the nipple is too low to be struck by the hammer.

NOVEL DESIGN IN NAVAL ARCHITECTURE.

THE difficulties which have occurred in the prosecution of the present war from the deep draught of our line-of-battle ships may, perhaps, secure attention to the following design for a great raft, propelled by an immense steam power, which has occupied the thoughts of its projector, Mr. Daft, a civil engineer, for a period of thirteen years. As will be gathered from the details, he contemplates a complete revolution in the existing system of naval architecture. To many the scheme may appear utterly wild and impracticable, but some may, nevertheless, trace in it materials for useful reflection. It is proposed that the raft should be composed of 300 pontoon shaped iron boats, nearly all 100 feet long by 10 feet wide and 7 feet deep, having semicircular bottoms and sides, and flanged on the edges or gunwales. With fifteen of these placed longitudinally, the length of the raft would be 1,500 feet, and 20 in breadth, with 5 feet spans between each, would give a width of 300 feet. Thus the deck area would be little short of ten acres. The pontoon boats it is proposed to brace together by diagonal tie bars, while the deck would be formed of timber six inches thick, firmly bolted to the flanges, and having hatchways into each of the boats, which would thus furnish the accommodation and stowage required for passengers and goods. Bulwarks are contemplated, 12 feet 6 inches high, and consisting of hollow iron stanchions, 33 feet 4 inches apart from each other, with iron compartments between, made to open from the top on centres. The whole mass would thus be braced together as if it were one huge solid substance 1,500 feet long, 300 feet wide, and 20 feet thick. It is proposed by the bold projector of this new leviathan to propel her by twenty-two steam engines of at least 200 horse-power each, eleven on each side of the raft, with paddles and screws affixed alternately. Into the arrangements for mooring, for saloon space, commander's quarters, an observatory, &c., it is not necessary to enter, but

[redacted]

the calculation is that the raft will carry a freight of 20,000 tons, though perfectly safe and steady without, obtain a speed of fifteen knots an hour, draw only 3 feet 6 inches of water, and give a surface sufficient to act as a floating breakwater in the roughest sea. The projector contends that it will be impossible to founder such a structure; that in case of running ashore, the boats grounded can readily be drawn off by the power of the engines; and that the principle of the design involving the repetition of so many given parts, as in the architecture of the Crystal Palace, these can be let out to different contractors, and the whole got together with the greatest rapidity and ease.—*Times.*

LIEUT.-COLONEL PARLBY ON THE FLIGHT OF PROJECTILES.

To the Editor of the Mechanics' Magazine.

SIR,—The origin of the rifle—the inventor's name—even the country he belonged to—is, I believe, unknown; but the general impression in England is that the Germans first adopted rifles in Europe. The want of written or verbal record leaves us at a loss to determine upon what principle the first inventor of the rifle acted. No doubt it was found that round balls from smooth barrels were deflected in uncertain quantities from the true aim, and an inventive mind, observing that the feathered arrow (the earliest weapon), from its rotation round an axis parallel to the line of flight, kept a direct course, may have proceeded to try the same experiment with balls fired from barrels and propelled by gunpowder, without having then considered the fact that the principal cause of the deflection of the round ball was the unequal resistance the fore part of the shot met with in its passage through the air, from its rotating round an axis perpendicular to the plane of flight; which rotation is caused by the rolling of the ball or its striking against the internal surface of the bore as it passes along; and thus a round ball is variously deflected—upwards, downwards, right and left, horizontally or obliquely—according to the direction of the axis of rotation, the deflection being towards the side where there is the least resistance.

But another observation may have led to the invention of the rifle. Gunpowder, in former years, was not so strong or so quick of ignition as at the present day; and, therefore, the ingenious inventor of the rifle may have thought that by delaying the passage of the shot a little in the barrel, by causing the spiral motion, the powder of a large charge being more fully inflamed would act with greater force upon the ball to give its full velocity proportionate to the charge, and the result of a more extended range would be the consequence with powder of slow ignition.

It is well known to those who are accustomed to fire-arms, that the rifle differs from the smooth barrel in having grooves or furrows cut in the interior of the cylinder, which, taking a spiral curve, cause the ball to rotate with an axis of rotation similar to that of an arrow, but *more violently*, the grooves making one turn in the small length of from 2½ to 4 feet; and I conceive this is one of the great errors in forming rifles—one turn in 100 feet would be better.

It would be useless to attempt to describe the variety of rifles. In some the grooves were deep, in others shallow; sometimes numerous, at others reduced to two. In some the ball was forced down with a strong ramrod assisted by a hammer; in others the balls being cast rather larger than the cylindrical part of the bore, were loaded at the breech and forced through the spirals by the pressure of the exploding charge; in others again balls were used with projections upon them fitting into the grooves; in others the round ball was covered with a piece of greased leather, and then forced into the barrel in loading, the leather fitting into the grooves and giving the necessary rotation to the ball; and now are used shot formed so as to expand at the end next the charge, and press into the grooves as they are driven through the barrel, as in the case of the Minié, or, truly speaking, Captain Norton's ball. Another of Captain Norton's plans is using an expanding sabot or bottom to the shot. The object of all these is to give a proper rotation to the ball as it passes through the air, round an axis coinciding with the line of flight.

The great object with cannon or fire-arms is to obtain the longest range with as little elevation as possible; and to obtain this, of course it is desirable to give the greatest possible velocity to the shot with a certain charge.

A few years ago, a Mr. Lovell proposed a two-grooved rifle, for which a ball was used having a projecting belt round it, which fitted into the grooves; and I shall particularly allude to this because it is the principle which has been taken by Mr. Lancaster in his celebrated guns, only in a much improved form. It was found on trials with Mr. Lovell's balls that they made a considerable whistle or noise in the air in the first part of their flight, but that the resistance of the air was so great, in consequence of the projecting band, that at 700 yards they were excelled in range, with the same charge of powder, by round balls well fitted to smooth barrels; the latter

ranging, at the same elevation, to 800 yards. It was also found that, at about 350 yards, the whistling almost ceased, and the balls ceased to rotate, and that, on striking the ground, they hit on the half sphere, showing that they had changed their horizontal axis to a perpendicular one.

It was also found that the sediment from the inflamed powder rendered it difficult, if not impossible, to ram down the well-fitting balls after 20 or 30 rounds; and in some instances part of the belt was driven off in passing through the grooves of the barrel. Now Mr. Lancaster has proceeded differently in some degree. He casts his cannon, or bores them, with two very shallow spiral incurvations in the interior of the bore, so that the bore is slightly oval; and the shot are elongated and ingeniously formed, some of cast, some of malleable iron, so as accurately to fit the bore. But when the enormous size of these guns is considered—10 inches bore!—and the weight of a shot of this shape and size, which is to be propelled with such velocity that a range of 4000 to 5000 yards is obtained; also that there is the danger of the fracture of his cast-iron shells, as well as the change of form and wedging in the bore of those of malleable iron, it is hardly possible to suppose that cast-iron, the metal his guns are made of, can sustain the shock of the discharge. In fact, a great number of them have become unserviceable from having burst, the fracture generally having taken place in the chase, about 2 feet from the muzzle, showing that it is not the explosion of the powder, but the violent strain and shock of the oval shells, that burst the guns.

Now, granting that by using rifled guns, and even cannon of moderate size, we obtain the advantage of a more correct aim than with smooth bores for a certain distance, it is certain that the rifled ball, towards the end of its range, is very uncertain; for directly the rifle rotation of the ball ceases, its irregularity of form, either if there are projections cast upon it, or from those it receives at its tail end, if an expanding shot, causes great deviations from the true plane of range. Robins found that the velocity of a rifled ball was less than that of a bullet fired from a smooth barrel with the same proportions of powder, and that its range was also less, and that when he tried a leaden ball of half an ounce at 12° elevation with one drachm of powder, the bullet ranged pretty well for 550 yards; but when he fired a similar ball at 24°, it ranged very irregularly, generally diverging from the line of direction to the left, and in one trial not less than 100 yards, the revolving motion being to the right.

It was also found that another cause of irregularity of flight in balls fired from rifles, was the great quantity of friction in the barrel, and the impossibility of rendering it equal in each experiment; so the velocities of rifle balls differ much more than those from a common smooth bore.

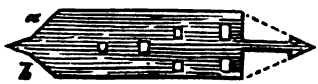
Whatever, therefore, tends to make the friction equal, and to lessen it, will increase the range; for it is certain, that the easier the bullet moves in the piece, supposing it not to shift its true position in the axis of the bore, the greater the accuracy and velocity of the flight will be.

We may well, therefore, ask whence are derived the accuracy and the length of range of the Minié rifle and the Lancaster gun. In the first, we are to recollect that the Minié ball weighs nearly one-half more than a round ball of the same diameter; hence it has much greater momentum than the latter to overcome the resistance of the air. Again, it is an expanding ball, totally preventing all loss of the propelling power by windage, as its expanding part next the charge completely fills up the section of the cylinder of the bore. The Lancaster shot and shells are also accurately fitted, and being of an elongated form are of greater weight than a spherical shot or shell of the same diameter; but if the weight of these balls was reduced to that of a round ball of the same diameter, with proper applications to prevent the loss by windage, and to keep the shot steady in the barrel, the shot from the smooth bore would have the advantage in certainty and extent of range.

I am, Sir, yours, &c.,

SAMUEL PARLBY.

P.S. If your correspondent, Mr. George Hunter, of Leysmill, will be kind enough to attend to my description, he will find that I particularly dwell upon the necessity of keeping the centre of gravity in the middle of the shot; and thus the head would not be heavier than the tail. The softness of the lead, and its compression by the force of the exploding charge, are effectually guarded against by the shape of the bottom, and by making the middle of the shot from point to point, as well as the wings, of steel or malleable iron; and if Mr. Hunter will take a small rod of steel, and form it as shown in fig. 1, he will avoid the defects he



complains of. The dark part represents the piece of steel or malleable iron the length of the shot, and flattened out at the tail end to form the wings; these are of course to be bent to the right and left at *a* and *b*, so as

[redacted]

to cause each wing to form a small angle of about $\frac{1}{4}$ of a degree with the axis of the shot. The dotted lines are the outline of the cast-iron or lead to be cast upon it when laid in the mould; the holes are to secure the sides by the metal running through them. Probably another mistake he may have committed, was giving too rapid a rotation, by making the angle of the wings with the axis of the shot too great; $\frac{1}{4}$ of a degree is quite sufficient.

S. P.

ON WORKING STEAM EXPANSIVELY IN MARINE ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—In the last three numbers of your Magazine I observe a paper by Mr. Allen, on the expansion of steam in marine engines; permit me to make a few observations on this question.

The first and greater part of Mr. Allen's paper consists of tables, showing the advantages to be derived from working steam expansively, in the reduced consumption of coal, the reduced size and cost of engines, &c. In the latter part of his paper he gives the method for doing this, which is nothing more or less than using a modification of Sims's combined engine. At the first sight, this mode of combining the cylinders seems a very advantageous one, but in practice it is found that the increased friction caused by the extra piston, combined with the extra cost of the engine, more than balances the advantages of such engines. Mr. Allen's engine seems a combination of the ordinary trunk engine and Sims's; a very casual glance will suffice to show that the enormous friction attendant upon this arrangement will prove fatal to their general application.

In order to use steam expansively with the greatest advantage, it should be generated to, and used at, a high pressure, with a minimum consumption of coal; and for this the present form of marine boiler is not suitable. The ordinary Cornish boiler has a heating surface of 1·49 square feet to every cubic foot of water space; whereas, the average heating surface of the boilers of 10 ocean steamers is 1·15 square feet to every cubic foot of water, leaving in favour of the Cornish boiler ·34 of a square foot to every cubic foot of water. The average duty of the Cornish pumping engine is 52,000,000lbs. lifted one foot high by the consumption of 84 lbs. of coal, and I see no reason why marine engines, with suitable boilers presenting an increased heating surface, should not execute a duty nearly equal to this, instead of a duty of 38,000,000, as at present.

I am, Sir, yours, &c.,

JOHN TRURAN.

August 13, 1855.

MATHEMATICAL EXERCISES.

To the Editor of the Mechanics' Magazine.

SIR,—I beg leave to propose, through your widely-extended Journal, the following exercises to your mathematical readers:—viz., To find the sums of the underwritten series, without using either the theory of indeterminate coefficients, or the binomial theorem, or the differential or integral calculus.

$$\text{1st.}\quad \frac{(n-1)\,(n-2)}{1\cdot 2}+\frac{(n-2)\,(n-3)}{1\cdot 2}+\frac{(n-3)\,(n-4)}{1\cdot 2}+\text{\&c. to 1.}$$

$$\text{2nd.}\quad \frac{(n-1)\,(n-2)\,(n-3)}{1\cdot 2\cdot 3}+\frac{(n-2)\,(n-3)\,(n-4)}{1\cdot 2\cdot 3}+\text{\&c. to 1.}$$

$$\text{3rd.}\quad \frac{(n-1)\,(n-2)\,(n-3)\,(n-4)}{1\cdot 2\cdot 3\cdot 4}+\frac{(n-2)\,(n-3)\,(n-4)\,(n-5)}{1\cdot 2\cdot 3\cdot 4}+\text{\&c. to 1,}$$

&c. &c.

It is evident that the number of terms in

1st, is	$n-2$.
2nd	$n-3$.
3rd	$n-4$.
&c.	&c.

Any method of summation which rests on purely elementary considerations, can be shown to lead to most important results in the higher mathematics. Perhaps some of your Cambridge men may do this.

I am, Sir, your constant reader,

A. R.

Dundee, August 9, 1855.

THE MATHEMATICAL THEORY OF PROJECTILES.

SIR,—Some time ago your correspondents occupied much space in the *Mechanics' Magazine*, in discussing the moon's motion. The question originated with some observations of your indefatigable and intelligent correspondent, Mr. Mushet, who made a quotation from my work, stating that the moon *did not rotate*, but only revolve round the earth. The opponents, instead of confining themselves to the question at issue, occupied many pages of the Magazine in matters totally irrelevant to the arguments on rotation; and consequently the whole ended in rambling confusion.

Another question is now mooted, and, unless you insist on your correspondents keeping themselves strictly to the subject before them, the whole will end as unsatisfactorily as the former discussions.

Your correspondents should have a clear conception of the *things* which are the subjects of discussion, over and above the mere *definitions and algebraic formulæ*; if not, they become bewildered in labyrinths of unmeaning expressions, making confusion more confused. It is not pure mathematics and geometry that are brought into question; it is the physical data of mathematicians. Why should mathematicians be more infallible in their physical deductions than engineers?

Arithmetical processes, or mere calculations, may be carried on without reference to physical causes; the equations may be almost identical in form, but applied to *different theoretical data*, and both arrive at the same results, as we have seen in many astronomical discoveries, made by different persons, including that of the planet Neptune.

Mathematical forms of calculation have been preserved from time immemorial to calculate the periods of the eclipses, &c., whilst the physical hypotheses of the movements of the heavenly bodies have many times changed in the interim. The present lunar theory was principally founded on the observations of Bradley and Maskeline, but is still very unsatisfactory. Many of the existing theories will not stand the test of observation.

Dr. Whewell has stated, that the *physical* theory of the moon was more difficult of comprehension "than the epicycles of Ptolemy, in their worst form." Even with regard to projectiles, professors of mathematics, after taking the students through an immense amount of intricate calculations, on the assumed paths of projectiles, are obliged to confess in the end, "that the problem was one of the most difficult in dynamics, and one (according to their statement) which is not yet reduced to a practical form. The calculations of gunnery are, therefore, necessarily founded on experiment, rather than exact mathematical reasoning." "According to our theory, the projectile *ought* to move in a symmetrical curve, equal each side of its axis; whereas in the *actual path* of a projectile, the descending branch is always shorter and steeper than the ascending one, and falls more perpendicularly." This is very discouraging to a student at the end of his studies, when it is expected that he shall be prepared to execute what he has been taught. All these difficulties and this confusion proceed from inconsistent data, and the want of a clear conception of the laws and natural results of physical causes, by which engineers are guided. I shall be very glad to see the question you have taken up properly discussed, and also the promised observations on my work, by "A Mechanic."

If this correspondent will keep himself strictly to the subject—mathematically and physically—I shall be happy to meet him. Let him first begin simply with the question, as quoted from Sir J. Herschel's "Astronomy," and prove its correctness physically by demonstrative parallelograms, and not fly off at a tangent to the orbit of Neptune.

I am, Sir, yours, &c.,

EVAN HOPKINS.

38, Thurloe-square, Brompton,
August 13, 1854.

LONG RANGE AND VERTICAL FIRE.

To the Editor of the Mechanics' Magazine.

SIR,—I regret your correspondent, "A Mechanic," in reply to my remarks, has thought it proper to travel so far into the regions of darkness for the purpose of endeavouring to maintain that the *assumed theories* of mathematicians demand more respect than the *theories founded on every day observations and experiments.*

I am also somewhat surprised at his stating that the discovery of the planet Neptune was made by means of calculations founded on the theory that projectiles rise and fall in the same angles.

Mathematicians themselves confess, as he states in the same letter, "that they are unable to grapple successfully with the problem," not because of the difficulties it involves, but owing to their endeavouring to force the projectile into an arc, and to describe equal spaces in equal times—conditions which may suit *geometrical* curves, but are not applicable to, nor reconcilable with, the laws of *physics*. If your correspondent

can assist the physico-mathematician in getting out of this dilemma, he will do a great deal of good; but, to effect this, he must obtain the *elements of the parallelograms*, compound and decompose them, according to the ordinary practical system adopted in the composition of forces, and not produce assumptions. Let him show how the objectionable parallelograms can be made consistently with the experimental facts. Practical experiments, and Mr. Hopkins's parallelogram of projectiles, show that the descent from the angles of 90° to 45° becomes vertical on their near approach to the horizon, and from this angle to zero the fall becomes more oblique, and the range diminished.

These are the results of experimental proofs, and *theory founded on practice*. Let your correspondent show us how the *mathematical theory* of equal angles at each extremity has been proved. If the projectile force becomes completely exhausted on the projectile being thrown up at 90°, and returns only by the force of gravitation, why should it not exhaust itself at all other angles?

If bodies fall at the same angle as projected, can they fall at all when thrown horizontally?

I am, Sir, yours, &c.,
CIVIL ENGINEER.

August 13, 1855.

THEORIES OF PRACTICAL MEN.

To the Editor of the Mechanics' Magazine.

SIR,—A correspondent signed, "A Mechanic," in your last Number, states, "that no class of men construct so many theories so little in harmony amongst themselves as do your practical men." I do not dispute this question, because it is very natural to suppose that the men who are engaged in carrying out so many works should sometimes fail, and start many crude theories; but I differ with him in the following statement, "that in a very few instances are their crude theories adopted," &c., "and are of very little, if any, further service to the world." What led to the crossing of the ocean by steam? What has brought our railways and locomotives to such perfection? or the telegraphs, and innumerable other works that could be mentioned? The theories of practical men or mathematicians? The crude theories and schemes of practical men are checked and corrected, but however crude the theories of mathematicians may be, they are allowed to contaminate the minds in schools, and by books, which evils are not so easily corrected.

I am, Sir, yours, &c.,
A REAL MECHANIC.

SIR JOHN HERSCHEL AND THE LAWS OF PROJECTILES.

To the Editor of the Mechanics' Magazine.

SIR,—On reading an extract from Mr. Hopkins's work on Geology and Magnetism, inserted in your Magazine, No. 1669, wherein the author quotes a paragraph from Sir John Herschel's Astronomy, in which it stated that *bodies fall at the same angle as they are projected*, I naturally concluded that it was a mistake, or at least a misquotation. I referred since to Herschel's last edition of Astronomy, and was astonished on finding in it the paragraph you have inserted. I could not have believed it. I asked a very intelligent friend of mine how he could account for such ideas; but his reply was so discouraging to the physical doctrines of mathematicians in general, that I am compelled to solicit, through the medium of your Magazine, the aid of some of the Cambridge Mathematicians to enlighten us on this subject.

I am, Sir, yours, &c.,
A STUDENT.

London, August 14, 1855.

STEAM BOILER EXPLOSIONS.

To the Editor of the Mechanics' Magazine.

SIR,—I quite agree with your correspondent, "E. W. F.," that Mr. Andraud has made a quite untenable suggestion. We have no idea how two masses of opposite electricity could form in two sections of one boiler, neither do we know anything of what he calls the explosion of masses of electricity. The power of this fluid in rending and fusing solids is known, when they bear a small proportion to the volume of the current passing along them; and we know its power of chemically composing and decomposing fluids; and based on this last fact it has been assigned, as a conjectural cause of explosions, that some electrical development decomposes the water into its constituent gases. But this is a suggestion supported by no evidence, and not at all received, neither does M. Andraud appear to make any reference to it. A mechanical effect created by conditions which engender a sudden development of a large increased volume of steam is, I believe, generally considered a better explanation of these disasters than recondite and mysterious refinements of electricity. Interruption of due circulation of water in the boiler, and then its sudden restoration, is probably the most frequent promoting cause of explosion. I formed a decided view of this agency after an explosion I witnessed; and the minute and masterly investigation of the subject of currents, in Mr. C. Wye Williams' last treatise, seems entirely confirmatory of that

view. Explanation of course must vary in varying cases. The boiler I refer to was the old fashioned dome-shape, 12 feet in diameter (a shape, by the bye, in which, contrary to M. Andraud's assertion, I have heard of many more explosions than in the cylindrical). It gave way immediately above the angle-iron at the base, as clean as if cut round with a knife. It was projected directly upwards with such force as to be seen over the ridge of a hill, which gave an estimated elevation of at least 300 feet, and the explosive effort was so uniform that it fell back into its seating merely reversed, with an eccentricity not exceeding a foot from its original position. The engine was standing for some repair of the tuyeres of a blast furnace. The firemen, who were both present at the morning shift, and had imprudently kept up the fire during the delay, were dreadfully scalded; they survived but a short time, and, as far as I could learn, one of them had just jerked the safety-valve to make all right, as they supposed, when the explosion instantly followed. Now the circulation, as Mr. Williams explains, is maintained by the descent of cooler particles of water forcing up the hotter water and steam. We know well that an entire suspension of such circulation is not uncommon in narrow water spaces, where there is no access of current at the bottom, the water being lifted entirely, and hanging between the under and upper masses of steam. If the same effect occurred to a great degree in a boiler of 12 feet diameter—and I see no reason why it should not—the consequence is obvious. Intense pressure and entire stagnation existing in the interior, a thin stratum of steam becomes interposed between the boiler bottom and the under surface of the water. Under the accumulated pressure above the water and in the water interspersed with steam, there is no point where the equilibrium is disturbed to promote an ascent of particles of vapour, and these are likely to liberate themselves from the water *downwards*, at the place where the heat generates them, with more facility than by traversing the weighted mass above, which presses into the space left by the disengaging particles. The interposing stratum, thus thickening, prevents all contact of water with the boiler bottom, the plate heats, and, when a sudden liberation at the safety-valve, or at the working valves, disturbs the forced balance of stagnation, the steam rushes upwards, the water descends *en masse* upon the overheated plate, and an immense volume of steam, suddenly developed, at once rends the iron. The bottom of the boiler in the case I refer to was reddened and purpled to a tint which showed a slightly oxidating temperature, probable 700° or 800°. To some such action must probably be assigned the fact that explosions frequently occur on starting the engine after a stoppage. Water at the heat of a high steam pressure approaches to a state which Mr. Dircks has very properly denominated "liquid steam." When nothing is required but a slight diminution of the pressure, to permit to be developed in a moment an immense volume of steam, which only remained liquid under the higher previous pressure; but when once vaporized, continues steam, raising the pressure higher than before. It is this power of the heated water to immediately convert itself to steam when the confinement of the boiler is removed, which completes the destructive effect of the explosion of our very objectionable large boilers containing large quantities of water. An apparatus to meet these circumstances, which convert the safety valve rather to a danger valve, was patented about a year since, by Mr. Dircks. A plug or link of fusible metal giving way when the contents of the boiler exceed a certain fixed temperature, sets free a weight which opens communication with a reservoir of cold water; this descending through a tube convoluted in the water of the boiler, abstracts the excess of heat. I have not heard of this apparatus being in use, but it seems worth trial. It will, probably, be necessary to make the cooling action gradual, lest a sudden diminution of pressure may enable the heated water not immediately in contact with the refrigerator to develop a sudden volume of steam, suddenness of development being the great element of explosion, as shown by the danger which follows the collapse occasioned by direct admission of cold water to an overheated boiler.

I am, Sir, yours, &c.,

David Mushet.

August 14, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Hill, Thomas Coendoz, of Stanton Lacy, Shropshire, gentleman. *An improvement in drain-pipes and tiles.* Patent dated January 19, 1855. (No. 149.)

Claim.—Forming or cutting off the ends of drain-pipes and tiles at an angle, such angle being any other than a right angle, so that when two pipes or tiles are laid together they form a scarf joint.

Smith, William, and Thomas Phillips, of Snow-hill, London, gas-engineers. *Improvements in cocks or taps, and in balls or floats to be used therewith.* Patent dated January 19, 1855. (No. 151.)

This invention consists of a mode of ap-

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plying vulcanized India-rubber to cocks or taps, and of forming balls or floats, to be used with cocks or taps, of galvanized iron, or tin plate galvanized.

DOUGLAS, WILLIAM, and JOHN CARSWELL, of Manchester, Lancaster, dyers. *Improvements in dyeing woven fabrics.* Patent dated January 20, 1855. (No. 155.)

This invention consists in dyeing woven fabrics subsequent to the process of padding, for the purpose of brightening and improving the colour.

SALAVILLE, SCIPION, of Paris, France, proprietor. *An improved method of preserving and purifying grain and seed.* Patent dated January 20, 1855. (No. 156.)

In carrying out this invention an air-tight chamber is formed beneath the granary or chamber in which is placed the grain or seed to be operated upon, the floor of the granary forming the top of the chamber, and being pierced with small holes, or having distributed over it a series of tubes communicating with the air chamber beneath and perforated all over their surface with small holes. The grain to be preserved is spread over this floor, and air is forced through the perforations, and up through the grain.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex street, Strand, London. *Improvements in paddle-wheels for propelling vessels in water.* (A communication.) Patent dated January 20, 1855. (No. 158.)

This is Wallis's invention, of which an illustrated description was given on page 590 of vol. lxii., (No. 1663.)

EISENMANN, WILLIAM, merchant, of Berlin. *A new construction for a hearth, applicable to all firing constructions or fire-places.* Patent dated January 20, 1855. (No. 160.)

In carrying out this invention, the upper part of the hearth is constructed with one or more contractions, which extend over either part or the whole length of the grate. At the point of contraction the hearth is pierced on each side with small holes for the admission of atmospheric air or steam, which communicate with longitudinal channels formed in the brickwork, the object being to supply air to the fire in a divided state.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the construction of seats and similar articles of furniture.* (A communication.) Patent dated January 20, 1855. (No. 161.)

This invention relates to a peculiar construction and arrangement of seats, such as chairs, music-stools, or ottomans, in which the interior of the seat is fitted up with a bureau with drawers or pigeon-holes, and with a compartment for music, arranged similarly to the ordinary "Canterburys" at present in use.

GEDGE, JOHN, of Wellington - street South, Middlesex. *Improvements in laminating metals, either in relief or bas-relief.* (A communication.) Patent dated January 22, 1855. (No. 162.)

The inventor describes an arrangement for "laminating metal in relief, or bas," in which a single pair of cylinders only is employed.

CARR, HENRY, of Peterborough, Northampton, civil engineer. *Certain improvements in railway crossings.* Patent dated January 22, 1855. (No. 164.)

In Mr. Carr's crossings, the point, the distance-pieces between the wing rails, and the bed, are all formed in one piece.

PAPE, JOHN HENRY, of Paris. *Improvements in pianofortes.* Patent dated January 22, 1855. (No. 165.)

The inventor describes a new instrument in which the tone is produced partly by metal forks and partly by strings. It has seven complete octaves, in a smaller and lighter case than that of the ordinary pianoforte.

JOHNSTON, ROBERT, of Drums-lane, Lock-street, Aberdeen, soap maker. *The use of certain portions of fish in the manufacture of soap.* Patent dated January 22, 1855. (No. 166.)

The inventor first boils fish or blubber, lets it settle, and then takes all except the heavy deposit at bottom (which is to be thrown away or considered refuse), and strains it through a coarse cloth or sieve, putting that which is left in the cloth or sieve into a press lined with fine cloth, and pressing all the loose matter out. The matter left in the press is put into a boiler, with one-fourth of tallow, and boiled with the usual alkalies for seven hours, a soap without smell being thus produced.

VASNIER, FRANÇOIS ARSÈNE, of Paris, France. *Certain improvements in fire-places.* Patent dated January 22, 1855. (No. 168.)

The inventor places at the back of the fire-place an apparatus composed of a fixed heat-reflecting plate, and a trap plate hinged to it, the latter being for the purpose of regulating and guiding the draft.

KILGOUR, WILLIAM, of Liverpool, Lancaster, merchant. *An improved manufacture of naphtha, paraffine, or paraffine oil.* Patent dated January 22, 1855. (No. 170.)

This invention consists in employing as the material from which the naphtha, paraffine, and paraffine oil are to be obtained, a certain mineral substance, a product of the Burman empire, called "earth oil."

ARKELL, PETER, of Stockwell, Surrey, engineer. *An improved mode of purifying whale and seal oil.* Patent dated January 22, 1855. (No. 171.)

The inventor distils in an iron still whale

or seal oil, sal-ammoniac, gamboge, and rosin or turpentine, causing them to be thoroughly incorporated by stirring, and applying heat to the still, so as to distil over the mixture. The result of this distillation is a peculiar oil, and a kind of black pitch remains in the still. This latter substance he calls "prime," and the invention mainly consists in applying it to the purification of oils.

Coates, John, of Salford, Lancaster, engineer. *Improvements in railways.* Patent dated January 23, 1855. (No. 172.)

In carrying out this invention the side of the railway chair is formed so as to correspond in shape on one side to the rail, and the other side is cast with a space into which is placed a block corresponding at its lower part to the form of the rail. This block is provided with a groove, within which is a key also extending into a groove formed within the chair; this key passes at its smaller end through a washer or washers, and is kept there by means of a pin. The block is provided with a recess at its upper part, and into this recess is placed a piece of wood bearing against the rail, and formed with a projecting part which takes into a recess in the chair, and prevents lateral motion.

Prince, Frederic, of South-parade, Chelsea, Middlesex. *Improvements in cartridges for fire-arms.* Patent dated January 23, 1855. (No. 173.)

The inventor steeps the paper or material of which the cartridge is to be made in a solution of nitric acid and sulphuric acid, in the proportions of three parts nitric to one part sulphuric, and uses with the finished cartridge greased wadding which is intended to leave the barrel of the fire-arm more freely than the ordinary wadding, leaving no fragments behind.

Dray, William, of Swan-lane, London, agricultural implement maker. *An improved machine for cutting chaff.* Patent dated January 23, 1855. (No. 174.)

A full description of this invention was given on page 361 of our last volume (vol. lxii., No. 1654.)

Fenton, James, of Low Moor, York, civil engineer. *Improvements in the manufacture of axles, shafts, rods, and bars.* Patent dated January 23, 1855. (No. 176.)

Claims.—1. The mode of manufacturing axles, shafts, rods, and bars, by welding together a series of bent plates of iron, so combined as to form a tubular mass consisting of several layers arranged concentrically, with or without a small core or centre, which may be either solid or hollow. 2. The manufacture of axles, shafts, rods, and bars, with an outer or surface plate of metal, of superior quality to that composing the interior of the axle, shaft, rod, or bar, or with an outer or surface plate of steel.

Pettit, George Brooks, and Henry Fly Smith, both of New Oxford-street, Middlesex, gas engineers. *Improvements in stoves and other apparatus for generating heat from gas, and in the employment and removal of the vapours produced by its combustion.* Patent dated January 23, 1855. (No. 177.)

Claims.—1. The causing of products of combustion of gas burners, by means of suitable apparatus, to be brought in contact with the primary or other gas flame. 2. The employment of moulded plates of glass or earthenware, varying in thickness, to produce illuminated devices in gas stoves. 3. The removal of the products resulting from burning gas by conveying them into a coal or other fire.

Laming, Richard, of Carlton-villas, Maida-vale, Middlesex. *Improvements in obtaining and combining ammonia.* Patent dated January 24, 1855. (No. 178.)

Claims.—1. The extraction of ammonia from coal gas, by the use of pierced and plain shelves or diaphragms, so combined in pairs with a purifying vessel that while the former serve by their holes to distribute the gas through the mass of purifying liquid, the latter, by their resisting surfaces, prolong the submersion of the divided gas without a corresponding increase in the depth of the purifying liquid. Also, the extraction of ammonia from coal gas by the use of pierced shelves or diaphragms in purifiers fitted with valves, as described. 2. The use of a certain scrubber without diaphragms for extracting ammonia by a continuous process of distillation from solutions containing it in a volatile state. Also, passing the volatile products emitted from any continuous still working volatile compounds of ammonia, into acid in a fluid state for combining the ammonia with the subsequent application of the unabsorbed vapours to heat fresh portions of liquid about to enter the still. Also, the use of a separate vessel connected by pipes with the distilling scrubber, or any modification of Coffey's diaphragm still, for decomposing the fixed compounds of ammonia contained in spent liquor by means of lime or magnesia with the agency of steam on its way to the main apparatus. 3. Combining ammonia with acid mixture or compounds of phosphate of lime by bringing into immediate contact with them ammonia, as it, or any of its volatile compounds, is eliminated from an ammoniacal solution, or a salt containing ammonia, and by which all intermediate operations are avoided. 4. The use of finely levigated raw gypsum for extracting ammonia from gas containing it and carbonic acid at any temperature low enough for the pur-

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pose. And also the repeated use for the purpose last mentioned of any mixture of sulphate of lime and inert matter after either a new addition of the earthy sulphate to the mixture, or the application of a levigating operation to break down in it the portion of sulphate of lime remaining undecomposed.

WEBSTER, JAMES, of Birmingham, Warwick, engineer. *A new or improved method of changing the direction of and multiplying motion.* Patent dated January 24, 1855. (No. 179.)

This invention consists in changing the direction of and multiplying motion by causing a fork, or two parallel bars, to embrace or engage with a screw, and by moving in the direction of the axis of the said screw, to communicate a rotary motion thereto.

ANDERSON, SIR JAMES CALEB, of Fermoy, Cork, Ireland, baronet. *Improvements in steering ships.* Patent dated January 24, 1855. (No. 180.)

Claims.—1. "The steering of ships or smaller craft by hydraulic pressure, or steam pressure, acting on a piston or pistons placed in either one or more cylinders. 2. A separate engine to work the force pumps in steam or sailing ships to obtain the hydraulic pressure, and when steam is used for steering, the steam boiler of the small engine is to supply the steam to the steering cylinder." 3. A particular arrangement of cylinders, &c., as described.

TUPPER, CHARLES WILLIAM, of the firm of Tupper and Carr, of Mansion-house-place, London, galvanized iron manufacturer. *Improvements in the construction and arrangement of coverings for buildings.* Patent dated January 24, 1855. (No. 181.)

This invention consists in constructing tiles of galvanized iron, or any other suitable material, each tile being turned up longitudinally at its two opposite sides, so as to form a species of tubular beading of any suitable section, the beading on one side being of rather larger diameter than the beading on the opposite edge of each tile, so as to allow the beadings of two or more similarly formed tiles to be slid into or over each other, and form a kind of telescopic joint.

LIVESEY, JOHN, of New Lenton, Nottingham, lace manufacturer. *Improvements in lace machinery.* Patent dated January 23, 1855. (No. 182.)

This invention refers to that class of lace machinery known as warp lace machinery, and consists in alterations of and additions to such machinery of loop or fringe forming instruments, placed in the needle bar, or in front of the fabric, or other convenient position, and in apparatus so arranged that loop or fringe threads may be thrown over or round the instruments, in order that they may take up a large amount of material, and so form long loops or fringes, the object of these additions being to enable the inventor to form a loop round suitable instruments so that when released from such instruments, the loop may be capable of being cut into a fringe. By this means a warp lace frame is enabled to make fringes, the united width of which is very much greater than the width of the frame employed in making it.

SCHMERSAHL, AUGUSTUS EDWARD, of Miles Platting, Lancaster, analytical and practical chemist, and JOHN AUGUSTUS BOUCK, of the same place, manufacturing chemist. *Improvements in the manufacture of sulphuric acid, and in apparatus for effecting the same.* Patent dated January 24, 1855, (No. 183.)

Claims.—1. The production of sulphuric acid by causing sulphurous acid gas to pass in combination with atmospheric air, through heated tubes. 2. Supplying such tubes with asbestos, or other substance, as before-mentioned. 3. Causing the sulphurous acid gas to pass through water, previously to being combined with atmospheric air. 4. A general arrangement and construction of apparatus.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improved machinery for raising and forcing fluids.* Patent dated January 24, 1855. (No. 184.)

In carrying out this invention two valve pistons with independent rods are fitted in the same barrel, and caused to work simultaneously, the upper piston sliding over the rod of the lower piston. Motion is transmitted to the pistons through vibrating segment racks by means of a lever, and thus the pistons are caused to recede from and approach each other alternately, and alternately lift a column of water.

SAMUEL, BARNETT, of Sheffield, York, comb manufacturer. *Improvements in the manufacture of knife handles, umbrella and stick handles, door knobs, articles of furniture, and other articles having the appearance and transparency of solid tortoiseshell.* Patent dated January 25, 1855. (No. 187.)

This invention consists in the manufacture of knife handles, umbrella, and stick handles, door knobs, &c., having the appearance and transparency of solid tortoiseshell, by moulding them of horn, and encasing them in tortoishell by means of heat and pressure.

BERNARD, CHARLES FREDERICK, of Plymouth, manufacturing chemist. *Improvements in the manufacture of superphosphate of lime.* Patent dated January 25, 1855. (No. 189.)

Claims.—1. The manufacture of dry superphosphate of lime, suited for agricultural use as manure, by submitting calcined bones or animal charcoal to the action of sulphuric or other acid, in the presence of artificial heat, either in a reverberatory or other furnace, or otherwise. 2. Dissolving out of superphosphate of lime (either obtained by the process above described, or otherwise) the soluble biphosphate and other soluble parts, and also the uncombined acid contained therein, and employing the solution so obtained in place of common water in the process of making further quantities of superphosphate. Also, dissolving out from superphosphate of lime the soluble biphosphate and other soluble parts contained therein; the solution thus obtained, either with or without the addition of alkalies, or their salts, being concentrated or evaporated by means of heat, applied in any convenient manner, so as to produce a granular mass of high fertilizing power.

ANDERSON, ALEXANDER WILLIAM, of Birmingham, Warwick, news agent. *Improvements in posting or exhibiting placards.* Patent dated January 25, 1855. (No. 190.)

These improvements consist in constructing suitable frames or cases to be erected on blank walls and other similar spaces, and also in adapting them to perambulating vans, in which cases advertisements and posting bills may be exhibited, and, if necessary, be withdrawn and protected at night.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

DELCAMP, MAURICE, of Paris, France. *An improved apparatus for advertising, or for the exhibition of placards.* Application dated January 19, 1855. (No. 152.)

The inventor describes an apparatus in which, by the opposite action of certain clock mechanism placed in an upper cylinder, and a coiled spring in a lower cylinder, an advertising cloth is wound off the upper upon the lower, the cloth between the two cylinders thus exhibiting a continual change of advertising matter.

RENNIE, MATHEW BOULTON, of Whitehall-place, Middlesex. *Improvements in preserving animal and vegetable substances for food.* (A communication.) Application dated January 19, 1855. (No. 153.)

This invention consists in applying a compound consisting of gelatine or jelly mixed with albumen and alcohol, in a liquid state, as a coating to the animal or vegetable substances to be preserved.

PEARCE, WILLIAM GORE, of Grosvenor-street, Camberwell, Surrey. *An improved method of projecting chain or coupled shot or shell from double or single-barrel guns, and causing them to explode simultaneously by electricity and other means.* Application dated January 20, 1855. (No. 157.)

The inventor describes a double gun cast in the solid, and having two barrels bored at an angle. The chambers are made to communicate from one vent by small touch-holes drilled from the vent into the right and left-hand barrels, and the shot are coupled together by a metal chain, the slack of which hangs outside between the muzzles. When the piece is fired the balls take up the coupling, and separate as they travel.

MARGUERITTE, FREDERIC, chemist, of Paris, France. *Improvements in the manufacture of soda and of potash.* Application dated January 20, 1855. (No. 159.)

This invention consists "in the application of oxalic and boracic acids to decomposing common salt or chloride of sodium and chloride of potassium, for extracting soda and potash, and in regenerating said acids by means of sulphuric, chlorhydric and carbonic acids."

TROTMAN, SAUNDERS, of Portman-square, Middlesex, hydraulic engineer. *Improvements in filtering apparatus.* Application dated January 22, 1855. (No. 163.)

In carrying out this invention the inventor causes the liquid to enter the filtering apparatus through passages furnished with a slide-valve or cock, by means of which the direction of the flow of the liquid, and consequently the filtering surfaces, can be instantaneously reversed, by which means a cleansing action is at once produced.

CAMP, JACQUES JOSEPH VAN, of Paris, France. *Improvements in pistons of steam engines.* Application dated January 22, 1855. (No. 167.)

This invention consists in "the use of segments which are always in tight contact with the cylinder, thus preventing the escape of steam from one side of the piston to the other."

BERARD-TOUZELIN, PIERRE HIPPOLYTE GUSTAVE, of Paris, France, manufacturer. *Improvements in the manufacture of artificial flowers.* Application dated January 22, 1855. (No. 169.)

This invention consists—1. In removing the superfluous wax from the leaves or other parts of artificial flowers by placing them between sheets of paper, or other suitable material, capable of absorbing part of the wax, when heat or other suitable agency is applied. 2. In fixing a sheet or sheets of gelatine, isinglass, or other suitable transparent body to the materials from which the flowers are to be made.

SELLWOOD, WALTER, of Cheapside, London, draper. *An improvement in spatter-*

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dashes. Application dated January 23, 1855. (No. 175.)

This invention consists in making spatter-dashes more portable than usual, by making the metal rods which are attached to each side of them with hinges at about midway between the knee and ankle of the wearer.

Gregory, John, and Andrew Peddie How, of Mark-lane, London, engineers. *Certain improvements in steam engines, and in packing for pumps and other machinery in which packing is required.* Application dated January 25, 1855. (No. 185.)

The inventors construct packing of tubes or hollow vessels of vulcanized India-rubber filled with air, gas, water, or other fluid, and having in some cases their rubbing surfaces faced with metal.

PROVISIONAL PROTECTIONS.

Dated July 11, 1855.

1552. Thomas Wright Gardener Treeby, of Westbourne-terrace Villa, Westbourne-terrace North, Paddington. Improvements in revolving fire-arms and cannon.

Dated July 20, 1855.

1641. Archibald White, of Great Missenden, Buckingham, conveyancer and land agent. Swinging beds and covers and tents, to enable soldiers and others to sleep off the ground and dry, with or without an ordinary tent.

1643. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in axles for railway and other purposes. A communication from Edmond Roy, of Villefranche, France, Superintendent of the Great Central Railway of France.

1647. Edmond Féau-Lefebvre, of Orleans, France. Improvements in obtaining motive power.

Dated July 21, 1855.

1649. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in the construction of voltaic batteries. A communication.

1651. George Henry Perry, of Wolverhampton, Stafford, manufacturer. An improvement or improvements in vessels or cases to be used for the preservation of articles of food. A communication.

1653. Edward Myers, of Rotherham, York, engineer. Improvements in buffers and other springs for railway and other carriages.

1655. Samuel John Pittar, of Lisle-street, Leicester-square, civil engineer. Improvements in the construction of bridges. Partly a communication.

1657. John Walter Cawley Wren, of Tottenham-court-road, Middlesex, iron bedstead manufacturer. An improved construction of folding perambulator.

1659. George Hepplewhite, of Grosvenor-street, Commercial-road East, Middlesex. Improvements in spare rudders for ships.

Dated July 23, 1855.

1661. Theophilus Henry Hastings Kelk, of Osgathorpe, near Loughborough, Leicester, clerk in holy orders. Rendering certain vegetable substances useful for the manufacture of paper and the formation of textile fabrics and cordage or ropes.

1667. *Charles Goodyear, of Avenue-road, St.* John's Wood, London. Improvements in the manufacture of boats and other vessels.

1669. George Handson Rollet, of Liverpool, Lancaster, surveyor. Improvements in projectiles for fire-arms.

Dated July 24, 1855.

1670. William Grindley Craig, of Gorton, near Manchester, Lancaster, engineer. Improvements in the mode or method of consuming smoke and in the machinery or apparatus employed therein.

1671. Louis Antoine Ritterbandt, of Warwick-street, Regent-street, M.D., and Joseph Bower, of Hunslet, near Leeds, manufacturing chemist. An improvement in the manufacture of manure.

1672. Lonsdale Bradley, of Richmond, York, gentleman. Improvements in reaping machines.

1673. Joseph Westwood, of Poplar, Middlesex, iron ship builder, and Robert Baillie, of Poplar, Middlesex, iron ship builder. Improvements in preserving timber built ships, also timber, or wood and wrought iron, used in situations exposed to the action of water or of weather.

1674. Henry Stent, of Warwick-place, Birmingham, Warwick, gas meter maker. Improvements in the construction of apparatus for measuring gas and other fluids.

1675. Samuel Twist, of Birmingham, Warwick, manufacturer. An improvement or improvements in producing ornamental inscriptions and devices on glass.

1676. Benjamin Wood, of Caledonian-road, Middlesex, chemist. An improved preparation of colouring matter for the manufacture of ink, artists' colours, and for other purposes for which such colouring matter may be applicable.

1677. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in breech-loading and self capping fire-arms and in percussion caps or primers, and in the mode of applying such percussion caps or primers to fire-arms. A communication from William Pratt, of Baltimore, United States of America.

1678. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in breech-loading ordnance and fire-arms and in their projectiles. A communication from William Pratt, of Baltimore, United States of America.

1679. Samuel Edward Steane, trading under the firm of Steane and Co., importers and manufacturers, of Oxford. The application of perfumery to articles of domestic use, such as candles, starch, washing blue, lamp oil, and such like articles.

1680. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in machinery for making pipes and tubes. A communication.

1681. Tony Petitjean, of Tottenham-court-road, Middlesex, chemist. Improvements in silvering, gilding, and platinising glass.

1682. Thomas Hewitt, of Morley Park Works, near Belper, Derby, underground mineral agent. Improvements in pumps.

1683. Richard Polkinhorn Huthnance, of Chipping Norton, Oxfordshire. Improvements in drying, and in apparatus to be used therein.

1684. Benjamin Bailey, of Leicester, machine maker. Improvements in manufacturing knitted fabrics.

1685. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in cutting wood. A communication.

1686. Charles Goodyear, of Avenue-road, St. John's Wood, London. Improvements in the manufacture of carriages and other vehicles.

1687. Jean Baptiste Marie Potin, chemist, and Antoine Gabriel Nicolas Lingée, landlord, of Rue Richer, Paris. An improved composition applicable to the coating of iron, wood, stone, metals, and other substances.

Dated July 25, 1855.

1688. Edward Samuel Tucker, of Kentish Town,

Middlesex, engineer. An improved busk and hook for stays.

1689. Jacques Girard, of Rue Notre Dame de Grâce, Paris, and Chancery-lane, London. Improvements in generating and applying steam to rotary engines of an improved construction.

1690. Vincent Scully, esquire, and Bennett Johns Heywood, gentleman, of Dublin. Improvements in vessels for containing and preserving fluids.

1691. William Weallens, of Elswick-villas, and George Arthur Crow, of Forth street, Newcastle-on-Tyne, mechanical engineers. Improvements in steam-engines.

Dated July 26, 1855.

1692. David Davies, of Heaton-lane, Stockport, Lancaster, iron and brass founder. A self-evident economic boiler, for heating with hot water buildings of every description.

1694. Thomas Mitcheson Hall, of Preston, Lancaster, engineer. Improvements in the construction of chimneys, more particularly applicable to the chimneys and funnels of locomotive and marine engines.

1696. John Gedge, of Wellington-street South, Middlesex. Improvements in pumps. A communication from Paul Legrese and Auguste Andrieu, of Castres, France.

1698. Thérèse Alexandrine Poncelin, of Paris, France. Improvements in treating or preparing coffee.

1700. Robert Henry Hancock, of West-street, Smithfield, London. Improvements in the means of stopping carriages or trains to prevent railway accidents.

1702. Thomas Dawson, of King's Arms-yard, London, engineer. Improvements in bedsteads, couches, and other like articles of furniture, whereby parts thereof can be made to form a fire-escape when required.

1704. Charles Goodyear, of Avenue-road, St. John's-wood, Middlesex. Improvements in carpet and other bags. Partly a communication.

Dated July 27, 1855.

1706. William Allen, of the Athenæum Club, Pall Mall, Middlesex, Captain R.N. A new vehicle for the transport of camp baggage.

1708. John Aaron Benfield, of Rotherhithe, Surrey. Improvements in propelling vessels.

1710. William Bridgewater, of Cheltenham, Gloucester, gentleman. Certain improvements in the manufacture of roofing and other tiles.

1712. John Whitehead, jun., of Elton, near Bury, Lancaster, and Robert Kay Whitehead, of the same place, bleachers and dyers. Improvements in the manufacture and finishing of textile fabrics.

1714. George Woods, of Crown-street, Finsbury-square, saddlers' ironmonger. Improvements in pack-saddles.

Dated July 28, 1855.

1716. Henry Robert Abraham, of Howard-street, Strand, Middlesex. A carriage on two wheels for passenger traffic and general conveyance of a number of persons, or invalid, or wounded persons, to be called a rotalter.

1718. François Georges Hyacinthe Levavasseur, of the firm of François Georges Hyacinthe Levavasseur and Auguste Joseph Levavasseur, of Paris, France, lamp manufacturers. Improvements in oil lamps, and an improved chimney for oil lamps.

1720. Robert Wilson, of Glasgow, Lanark, finisher. Improvements in folding and preparing or pressing woven fabrics and other materials.

1722. James Kerr, of Bedford-terrace, Trinity-square, Southwark, Surrey. Improvements in revolver fire-arms.

1724. Thomas Barnabas Daft, of the Isle of Man, esquire. Improvements in inkstands.

Dated July 30, 1855.

1726. James Peacock and Henry Heaton Barry, of Bedford-street, Strand, Middlesex. Improvements in instruments for making copies of writings simultaneously with the originals.

1728. Charles Piper, gun-maker, of Cambridge. The improvement of gun-stocks of every description used both for sporting and military purposes.

1730. William Truran, of Marazion, Cornwall, civil engineer. Improvements in smelting and in apparatus to be used therein.

1732. John Hanson, of Dough, Belfast, Antrim, Ireland, land agent and farmer. Improvements in machinery or apparatus for digging potatoes.

Dated July 31, 1855.

1734. Herbert Mackworth, of Clifton-wood House, Clifton, Gloucester, mining engineer. Improvements in washing and separating minerals and other substances in a granular or pulverulent state.

1736. Hall Colby, of New York, United States of America. Improvements in the construction of an instrument for taking altitude angles, called an improved altimeter, or self-adjusting quadrant.

1738. Louis Narcisse Dupont, manufacturer, of Louviers, French Empire. Improvements in making an improved fabric, called drap de soie.

Dated August 1, 1855.

1742. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Certain improvements in manufacturing paper, pasteboard, and pulp. A communication from H. V. Pinondel de la Bertoche, of Paris.

1744. Charles Vaughan, of Birmingham, Warwick, manufacturer, William James Vaughan, of Birmingham, manufacturer, and Richard Vaughan, of Birmingham, manufacturer. An improvement or improvements in making and attaching the handles of iron bowls and other iron vessels.

1746. Leon Glukman, of Dublin, professor of natural philosophy. An improved box for papers, letters, and other documents.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1739. Joseph Robert, of Liege, Belgium, mechanical engineer. Improvements in machinery for manufacturing fire-arms. August 1, 1855.

1740. Bashley Britten, of Anerley, Surrey, gentleman. Improved projectiles. August 1, 1855.

1754. William Meyerstein, of Friday-street, London. A new and improved sewing machine. August 3, 1855.

1770. Arthur Warner, of New Broad-street, London, merchant. Improvements in coating or combining sheet-iron and steel with sheet-lead, zinc, tin, copper, or alloys of such metals. August 4, 1855.

NOTICES OF INTENTION TO PROCEED.

731. John Taylor. An improvement in the manufacture of covers for books.

740. Thomas Prideaux. A new or improved plough for draining and other similar purposes.

744. William Eathorne Gill and Henry Brinsley Sheridan. Treating fish for oil, and utilizing the products of such process.

756. Thomas Squire. Improvements in removing hairs from hides or skins. A communication.

757. William Goostrey and George Hulme. Improvements in machinery or apparatus for manufacturing paper.

770. Alexander Rollason. Certain improvements in photography.

772. Richard Stones. Improvements in taps or cocks for drawing off fluids.

[redacted]

773. Joseph Hull. Improvements in the machinery and apparatus for grinding corn.

784. William Ricketts and Thomas Bulley. Improvements in producing ornamental designs on painted or japanned table-covers.

811. Isaiah Vernon. An improvement or improvements in the slide valves of steam engines.

814. Jules Laleman. Improved machinery for combing flax and other similar fibrous materials. A communication.

829. Thomas Kennedy. Improvements in shot or projectiles.

849. Henry Woodhouse. Improvements in the construction of crossings for the permanent way of railways.

873. William Savory. Improvements in machinery for crushing grain and other substances, and for cutting chaff.

902. Alexandre Balan. Improvements in transporting passengers and goods.

952. Emile Muller, Joseph Gilardoni, and Xavier Gilardoni. A grooving and clamping hooked tile, by means of which the entire covering of a roof is tied together, a machine for the fabrication of such tile, by which it is continuously delivered from the mould through a peculiar system of delivery applicable to any matter that may be moulded, and a conterminous succession of furnaces for its burning.

1054. Matthew Allen. An improved valve, particularly applicable for regulating the supply of air to furnaces and fire-places.

1255. John Charles Pellenz. Improvements in the manufacture of iron wheels.

1263. Henry Cartwright. An improved steam cock.

1347. John Avery. Improvements in oscillating steam-engines. A communication.

1418. John Louis Jullion. The manufacture of paper, card, and mill-board, from certain vegetable productions.

1436. Auguste Edouard Loradoux Bellford. Improvements in breech-loading fire-arms, and cartridges relating thereto. A communication.

1470. Louis Joseph Frédéric Margueritte. Improvements in the manufacture of glass and crystal.

1479. John Skelley. Improvements in the construction of carriage wheels.

1489. John Weems. Improvements in drying grain and other substances.

1507. James Connor. Improvements in apparatus for communicating between the engine drivers and the guards of railway trains.

1515. James Bullough, Robert Willan, and John Walmsley. Improvements in machinery or apparatus for warping by power.

1560. Frederick Howorth Edwards. Improvements in obtaining motive power from fuel, air, and water.

1566. Joseph Henry Tuck. Improvements in apparatus for condensing or exhausting atmospheric air or other elastic fluids. A communication.

1580. Henry Grafton. Improvements in the manufacture of fire lighters, which are also applicable for other burning purposes.

1594. Joseph Henry Tuck. Improvements in blowing apparatus, and other apparatus and engines in which air and other elastic fluids are used. A communication.

1613. Charles Toye. Improvements in looms for weaving pile and terry fabrics.

1618. William Ball and John Wilkins. Improvements in the manufacture of warp fabrics.

1620. Auguste Edouard Loradoux Bellford. A new or improved method of condensing vapours and smoke. A communication from Professor Frederic Kuhlmann, of Lille, France.

1654. Charles Goodyear. Improvements in the surfaces used for printing. Partly a communication.

1664. Charles Goodyear. An improvement in manufacturing moulded articles made of compounds of India-rubber. A communication.

1666. Charles Goodyear. Improvements in the manufacture of combs.

1667. Charles Goodyear. Improvements in the manufacture of boats and other vessels.

1677. John Henry Johnson. Improvements in breech-loading and self-capping fire-arms and in percussion caps or primers, and in the mode of applying such percussion caps or primers to fire-arms. A communication from William Pratt, of Baltimore, United States of America.

1678. John Henry Johnson. Improvements in breech-loading ordnance and fire-arms and in their projectiles. A communication from William Pratt, of Baltimore, United States of America.

1680. Richard Archibald Brooman. An improvement in machinery for making pipes and tubes. A communication.

1684. Benjamin Bailey. Improvements in manufacturing knitted fabrics.

1685. George Tomlinson Bousfield. Improvements in cutting wood. A communication.

1686 Charles Goodyear. Improvements in the manufacture of carriages and other vehicles.

1691. William Weallens, and George Arthur Crow. Improvements in steam engines.

1704. Charles Goodyear. Improvements in carpet and other bags. Partly a communication.

1722. James Kerr. Improvements in revolver firearms.

1728. Charles Piper. Improvements in gunstocks of every description used both for sporting and military purposes.

1732. John Hanson. Improvements in machinery or apparatus for digging potatoes.

1740. Bashley Britten. Improved projectiles.

1770. Arthur Warner. Improvements in coating or combining sheet-iron and steel with sheet-lead, zinc, tin, copper, or alloys of such metals.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed August 3, 1855.

1152. John Cruickshank.
1160. Francis Leeshing.
1161. David L. Davis.
1174. Silas Safford Putnam.
1175. Samuel Edwin Robbins.
1229. Thomas Vincent Lee.
1256. Richard Whytock.
1280. David Newell Brown Coffin.
1282. Cyrus Curtice.
1284. Ethan Allen.
1300. John Buncle.

Sealed August 7, 1855.

307. John Lees and William Heap.
328. John Foster.
365. Richard Archibald Brooman.
375. Jean Wothly.
391. Thomas Harrison.
555. James Murdoch Napier.
601. John Henry Johnson.

781. David Cope.
1225. Etienne Jules Lafond and Count Louis Alfred de Chateauvillard.
1315. John Sutton Nettlefold, Edward John Nettlefold, and Joseph Henry Nettlefold.

Sealed August 10, 1855.

326. Robert Kerr.
344. John Mason, Samuel Thornton, and Thomas Spencer Sawyer.
345. Henry Spencer.
371. Henry Schottlander.
404. John Edmund Gardner.
420. Alexander Brown.
547. Joseph Malcolmson, Robert Shaw, and William Horn.
1046. Samuel Cunliffe Lister.
1195. William Simson Young.
1297. William Baines.
1338. Nathan Hackney.
1354. George Cottam.
1362. Samuel Cunliffe Lister.
1371. George Frederick Morrell.
1393. John Henry Johnson.

Sealed August 14, 1855.

341. Robert Molesworth.
348. Eugène Carless.
350. William Carter Stafford Percy and William Craven.
359. John Hackett.
360. John Hackett.
372. Samuel Kershaw and James Taylor.
434. James Reddie.
436. Jesse Brickles, Thomas Thorpe, and Joseph Lillie.
450. Richard Archibald Brooman.
486. Andrew Hotchkiss.
524. William Foster.
531. James Murdoch.
921. Louis Alexandre Avisse.
1322. John Greenwood.
1324. Samuel Colt and William Thomas Eley.
1366. William Clay.

NOTICES TO CORRESPONDENTS.

J. Norton.—Yours in our next.

Vindex.—We cannot insert your letter unless you send us your name confidentially.

Erratum.—Last number (1670), page 142, second column, line 22 from bottom, *for* Steven Williams Pugh, *read* Stephen Williams Pugh.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

[redacted]

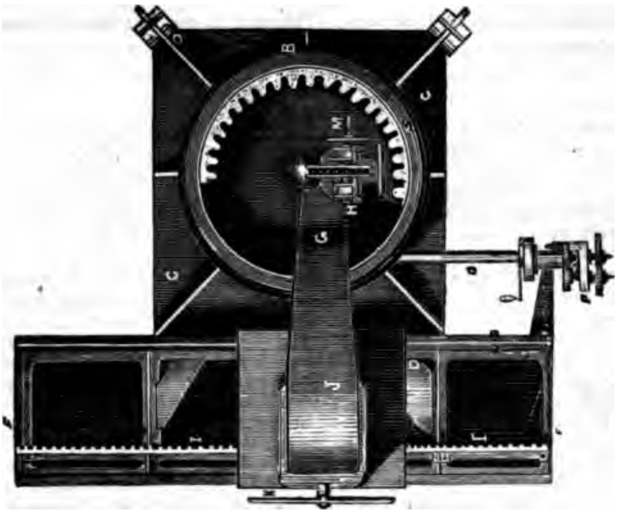
Mechanics' Magazine.

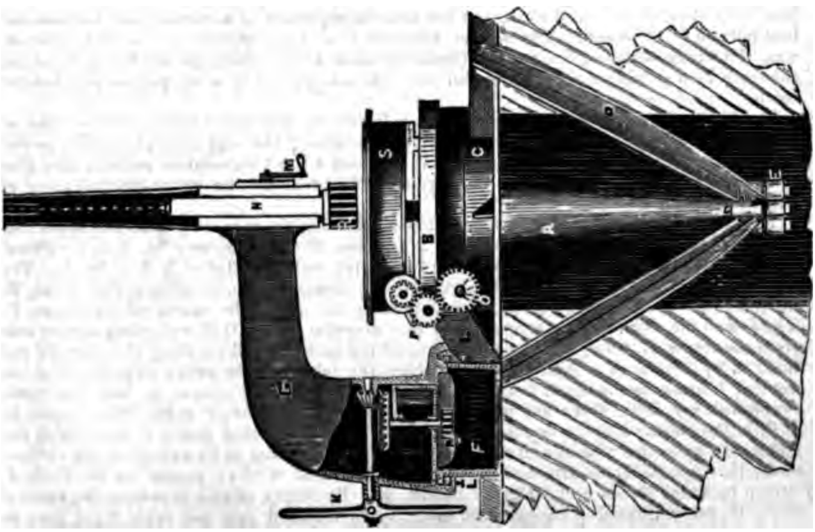
No. 1672.] **SATURDAY, AUGUST 25, 1855.** **[Price 3d**

Edited by R. A. Brooman, 166, Fleet-street.

JACKSON'S MACHINE FOR MOULDING COG AND OTHER WHEELS.

Fig. 2.





JACKSON'S MACHINE FOR MOULDING COG AND OTHER WHEELS.

The difficulty experienced in the course of practice, in not being able to find wheels for driving machinery exactly suited in form, strength, and speed to the purposes required—(a difficulty that has been extensively felt, notwithstanding the very large and costly stock of wheel patterns existing in this country)—led Mr. P. R. Jackson, of Manchester, some years since, to investigate the subject with a view to discover if some mode of construction could be adopted which would enable the founder to make cog-wheels from a simple segment of two, three, or more teeth of any diameter, pitch, breadth, or shape of tooth, without the use of a pattern in the ordinary way. The result of that gentleman's investigations has been the production of a very important and valuable machine, a description of which is the subject of the following paper, read by him at a recent meeting of the Institution of Mechanical Engineers, Birmingham.

The process hitherto adopted for making the best cog-wheels, whether spur or bevel wheels, has been to construct an entire pattern of wood, an exact *fac-simile* of the wheel to be cast, having each tooth formed and shaped upon it with great care. In all cases this involves a considerable expense and time, besides requiring very careful stowage till the pattern is next needed; but in the case of large wheels this becomes a serious consideration, particularly the time required for preparing the pattern, which causes a great addition to the loss and inconvenience occasioned when an accident happens to one of the wheels in a factory, thereby stopping a large portion of the machinery. It will be seen that the plan now submitted enables the founder to produce wheels in the shortest possible time, and with a degree of accuracy which is quite unattainable in the usual way, in which patterns are often made in a hurry of imperfectly seasoned timber, and are rarely true even for a short time, and unless made from timber that has had years to season, constructed with the greatest care, and carefully stored, soon become valueless altogether. The proper form of teeth, which in every case should depend upon the dimensions of both the wheels which are to work together, can seldom be obtained in the ordinary way, owing to the great expense of good patterns. This often leads to the adoption of a form of tooth which is but an approximation to that degree of truth which is readily attainable by the plan now submitted. It has often been found that wheels of the same pitch, and breadth, but from different makers, will on this account not work well together; this difficulty has sometimes been got over by a hand process of chipping and filing (commonly termed pitching and trimming), but such a process, besides the great objection in regard to expense, involves the inaccuracy inevitably attaching to hand work, and has also the objection of removing the hardest and best portion of the metal. The nearest approach to accurate construction in this direction was, the writer believes, the attempt (formerly made by Mr. Brunton, of Soho), to shape the teeth by a slotting machine, the tool of which was guided by a templet of the desired tooth.

To obviate the difficulties that have been referred to, the writer conceived the idea of placing in the foundry a machine on the principle shown in the engravings, by which, as will be seen, he is enabled to produce with great accuracy a short segment of pattern, and also to mould with equal accuracy from the segment thus produced the entire circumference of the wheel required.

Fig. 1 is a vertical elevation of the machine, showing the moulding-box, and apparatus connected with it, partly in section; fig. 2 is a plan of the machine; fig. 3 is a vertical section of the table and moulding-box; and fig. 4 is a sectional plan at X X in fig. 3. The machine consists of a vertical spindle, A, with a circular horizontal table or face-plate, B, upon it; this spindle works in the conical bearing formed in the centre of the frame, C. The foot of the spindle, A, is supported by four diagonal struts, D D, extending downwards from the frame, C, which support the weight of the table, B, and anything that may be put upon it, by means of a footstep, E, by which the table can be raised at pleasure in the conical bearing in the upper frame, C, thereby enabling the workman to turn the table round with very little force and perfect steadiness, though bearing great weight upon it. F F, in the elevation and plan, is a horizontal slide-bed, attached firmly to one side of the frame, C; upon this slide is moved the sliding-jib, G, carrying at its extremity the vertical slide, H. A rack, H, is attached to the slide, in which works a pinion on the shaft, J, driven by bevel wheels and the cross handle, K. By means of this apparatus the vertical slide, H, can be placed in any position that may be required over the table, B, or may be removed entirely clear from it on either side. The set screws, L L, are for the purpose of fixing the sliding-jib firmly upon the bed, and holding it in any position that may be required.

[redacted]

The vertical slide, H, is moved by a rack and pinion, worked by a handle and shaft, M, and is rather more than counterpoised by a weight attached to a chain passing over a pulley at the top. A ratchet-wheel with pall is fixed upon the handle, M, to hold the slide from being drawn up by the balance-weight, or forced up by the moulder, and the balance-weight is made a little in excess so as to insure a pressure always upwards against the pall of the ratchet. On the lower end of the slide, H, the block of wood out of which the pattern of the teeth is intended to be produced, is fixed by being first screwed to a metal plate, which is bolted to the slide, H, being fitted to the plate with vertical and horizontal guides, and having corresponding ribs let into the pattern-block to hold it perfectly steady during the subsequent operations of cutting and moulding, and also affording the means of fixing the pattern true and square upon the plate on any subsequent occasions. The worm-wheel, N, is fixed on the under side of the circular table, B, and is moved by the worm and shaft, O, which shaft is turned round by the handle and change-wheels, P, similar to an ordinary dividing or wheel-cutting machine. The worm and worm-wheel are constructed with great accuracy, and are protected from injury and exposure to any dust of the foundry by a water-lute, V, consisting of a vertical ring cast upon the under side of the table, and revolving in a small circular trough of water attached to the plate of the lower frame. By turning the handle, P, the required number of times, having previously adjusted the change-wheels so as to suit the number of teeth in the wheel intended to be moulded, the circular table, B, is turned round an interval equal to the pitch of the wheel, and this movement can be accurately repeated in succession through any portion of the circumference.

Fig. 3.

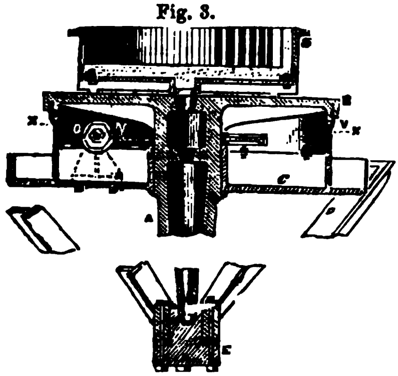
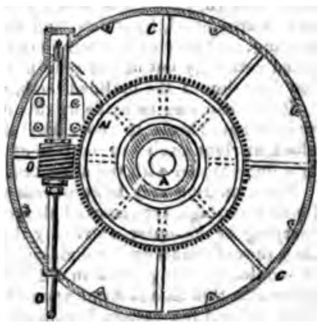


Fig. 4.



A block of wood, R, having been fixed upon the slide, H, the slide being adjusted at the required distance from the centre of the table, and the change-wheels having been arranged to suit the required number of teeth, a suitable cutter is fixed in a horizontal spindle, which revolves in a stand fixed upon the main table, B, at the correct distance from the centre of the table corresponding to the radius of the intended wheel. This cutter is made to revolve rapidly, and the pattern-block is then moved down gradually by the vertical slide, H, until a parallel cut is obtained through the entire block, forming one space in the pattern. The block is then raised, and by turning the table round the distance of the pitch, and repeating the cut by passing the slide down again before the cutter, another space is formed; which operation is repeated until all the required spaces are cut in the segment pattern. The pattern is made to terminate at somewhat less than half a tooth on each side, and a thin metal shield is fixed on each end in the direction of a radius of the circle, projecting about an inch beyond the crown or point of the tooth, for the purpose of preventing the moulder in the subsequent process of moulding from disturbing the teeth that he has previously formed in the sand. The formation of the short segment pattern, R, being completed, the cutter and stand are removed, and the moulding-box, S, placed on the table. In the conical hole in the centre of the table is fitted a bush, in which an upright spindle works, the purpose being for measuring from it the diameter of the wheel, and for strickling or levelling the sand in the moulding-box, S, to form the bottom of the mould of the intended wheel, previous to commencing the moulding of the teeth.

The moulding of the teeth is performed in the following manner;—The segment pattern R, is brought down by the slide, H, until it rests upon the levelled sand forming the bottom of the mould, the top of the segment being level with the edge of the box, and it is

there held by the ratchet and pall, and weight. The moulder then rams up in the ordinary way that portion of the box opposite the segment pattern, and after venting the teeth, removing the pall, he draws the pattern by means of the rack and pinion of the slide, H; he then turns the table round by the handle, P, through the interval equal to the number of teeth contained in the segment pattern. The pattern is then again lowered, and the ramming up of the mould repeated in the fresh position of the box, and the same process continued until the entire circumference of the wheel is moulded. In sliding down the pattern into each fresh position, it is prevented from disturbing any portion previously moulded, by its not actually touching the sand, and the shield plates on each end of the pattern prevent any risk of injury in the process of ramming. These plates leave a narrow channel in the sand, causing a small fin on the centre of the crown of the tooth at that position, which is broken and chipped off by the dresser after casting. The moulding of the cogs (the essential part of the mould) being thus completed, the box can be removed from the machine, and the moulder can proceed with another wheel, whilst other hands place the cores in the mould already formed. The spaces between these cores form the arms of the wheel, and the centre of the wheel is cored out in the ordinary way; the rim of the wheel is formed by the spaces left between the outer extremities of the cores, and the sand forming the teeth, and the boss or nave is formed by the space between the centre core and the inner ends of the cores. The top box, having the lower edge turned, is rammed up on a true surface plate, forming simply a flat top to the mould, and when placed upon the bottom box, the upper edge of which is also turned, and is on a level with the upper surface of the intended wheel, the sand being strickled off to the edge, forms a perfect joint; and with the cores before named completes the mould for the wheel.

Bevelled wheels are made by the same system on the machine, from a short bevel segment pattern, to produce which a peculiar cutter stand is used, admitting of adjustment to any desired bevel, by which, and the machine, the operator is enabled to impart a correct spacing, and very nearly complete the entire segment. The pattern for a bevelled wheel is lifted vertically out of the sand in the same direction as a spur wheel, and does not slide in the direction of the inclined teeth, on account of the tapered form of the teeth.

Racks can also be made by this machine from a few cogs, by attaching a dividing screw and change-wheels to move the sliding jib and vertical slide, H, and fixing the pattern block at right angles to the face of the slide by an angle bracket, so as to mould the rack in a line parallel with the slide-bed.

For moulding very large wheels extending beyond the range of the apparatus, the sliding jib and carriage are removed altogether, and a horizontal arm fixed on the revolving table, carrying at its outer extremity the vertical slide, H, and the segment pattern, which are then moved round by the dividing gear, instead of moving the moulding-box, the operation of moulding taking place in a circle round the machine. The cutter-stand for cutting the pattern in this case is fixed upon the ground at the proper distance from the centre of the machine, and the pattern is made to move past the cutter, instead of the cutter moving from space to space of the pattern, as before.

The following advantages are experienced in moulding by this machine;—Each wheel being made from a pattern of its own, specially adapted to work into its fellow, and not with reference to any other wheel, the general principle that *any two wheels should have the particular form of teeth that will work best together*, can be strictly carried out without difficulty, and at a trifling cost.

The accuracy which has hitherto been with difficulty obtained, even in the best patterns, is by this machine strictly imparted to the stand itself. The teeth, however long or broad, can by means of the slide, H, be drawn out of the mould without any taper allowance whatever, and the workman's attention being directed to a few teeth only at a time, he is more likely to give them special care. The time not unfrequently spent in what is called mending the mould, but which, in fact, from the difficulty of guiding the hand, is too often found to impair the correctness of the work, is thus saved. The result is the production of spur and bevel gear of so much greater accuracy than has been produced by other means, that they can be run at a higher speed than has been hitherto considered advisable in heavy gearing. There is also less need for mortise-wheels, as the noise of gearing proceeds principally from too much clearance, and the want of truth in the teeth. This plan of moulding allows of H spokes, with flanches round the inner edge of the rim, being adopted, as readily as the ordinary + or T section of spoke; the H spoke makes a stronger wheel, but is not easily obtained by the old system.

Spur wheels, with shields or flanges to the crown or pitch line, are made with greater facility than by the ordinary process of moulding, as the lower shields are more easily withdrawn, owing to the absence of sand in the centre of the mould.

The large, and in some cases valuable fireproof buildings erected for the stowage of wheel

[redacted]

patterns, will, by the adoption of this process, be saved, as one machine gives a greater range of pattern than the largest stock contains.

This method is useful in enabling the founder to match exactly any old wheel, whether the same have parallel or taper teeth, by forming a short segment pattern to work with it with the greatest correctness practicable, and without having to adapt or modify any previous pattern.

It may also be observed that the breakage of a wheel generally implies a deficiency in strength for the work it has to do, but with the old pattern the strength cannot well be increased.

In order to show in how short a time a wheel can be produced by this process, an instance may be mentioned of a spur-wheel, for which the following order was sent to the author, by telegraph, from Bristol, on 1st December last:—

"One spur-wheel, twenty-eight cogs, two feet three diameter at pitch line, cogs two and a quarter long, eight inch broad, six and five-eighths round eye, cast, four arms. Send by rail immediately. Write."

This order was received at the writer's works at 3½ o'clock in the afternoon; the tin templet, steel cutter, and segment to the right size, pitch, and number of cogs, were produced; the wheel was moulded and cast, weighing 6¼ cwt.; and, after remaining five hours in the sand, was taken out and dressed, carted nearly two miles, and forwarded by the Bristol train, which left Manchester at half-past 9 o'clock the following morning, being a total time of 18¼ hours; 13 hours being the actual time of making the wheel.*

REPORT OF THE COMMISSIONERS OF PATENTS.

The Commissioners of Patents appointed under the Patent Law Amendment Act, in compliance with the terms of the third section of that Act, have made the following report† of all their proceedings for the year 1854, in continuance of their first report of proceedings for 1852—3, dated 31st July, 1854. (See *Mechanics' Magazine*, vol. lxi., page 272, No. 1623.)

The number of applications for provisional protection recorded within the year 1854 was 2,764; the number of patents passed was 1,876; the number of specifications filed was 1,828, and the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 888.

"The number of applications recorded within the first six months of the current year (1855) was 1,493, showing a probable increase as compared to the number of the year 1854.

All the provisional, complete, and final specifications filed in the office upon the patents sealed under the Act, from the 1st October, 1852, to the 30th June, 1855, 4,897 in number, have been printed and published with lithographic outline copies of the drawings accompanying the same. The prints are sold to the public at the patent office, and each specification is printed and published within three weeks of its deposit in the office.‡

The provisional specifications filed in the office within the same period and lapsed and forfeited, 2,290 in number, have also been printed and published.

Printed certified copies of all the specifications filed in the office up to the 30th June, 1855, as also certified copies of patents and of the record book of assignments of patents and licences, with copies of such assignments and licences, have been sent, in continuation, to the office of the Director of Chancery in Edinburgh, and the Enrolment Office of the Court of Chancery in Dublin.

The following is a list of the publications made by the Commissioners since the commencement of the Act (1st October, 1852). The whole are printed in imperial 8vo., and the specifications alone form 170 vols. of letter-press, and the like number of vols. of lithographic drawings.

INDEXES OF PATENTS.

1. *Titles of Patents of Inventions* (chronologically arranged). From March 2, 1617 (14 Jac. I.) to October 1, 1852 (16 Vic.). 2 vols. (1554 pages.)

2. *Alphabetical Index of Patentees of Inventions*, for the same period. 1 vol. (647 pages.)

3. *The Subject-Matter Index of Patents*, for the same period. 2 vols. (970 pages.)

4. *The Reference Index of Patents*, pointing out the Office in which each enrolled Specification of a Patent may be found; the

* An interesting discussion which took place after the reading of Mr. Jackson's paper will be reported in our next.

† We have omitted parts of the Report.—Ed. M. M.

‡ This statement is not strictly true, since a longer period than three weeks often elapses between the deposit and the publication of specifications. Great improvement has, however, taken place, in this respect, during the past half-year.—Ed. M. M.

Books in which Specifications, Law Proceedings, and other subjects connected with Inventions have been noticed or reported; also such of the Specifications of Patents granted since the 14th of James I. as have been published by the Commissioners. 1 vol. (681 pages.)

5. *An Appendix to the Reference Index of Patents of Invention*, containing abstracts from such of the early Patents and Signet Bills as describe the Nature of the Invention, and on which Specifications were not enrolled.

6. The Chronological Indexes of Applications for Patents and Patents Granted from the 1st October, 1852, to the 31st December, 1853. 1 vol. (258 pages).

7. The Alphabetical Indexes for the same period. 1 vol. (182 pages).

8. The Subject-matter Indexes for the same period (in course of preparation, and to be published before the end of the current year).

9. The Alphabetical Index for the year 1854. (120 pages).

SPECIFICATIONS.

1. The series of 4,746 Final Specifications, 151 Complete Specifications, and 2,290 Provisional Specifications lapsed or forfeited, the applicants having neglected to proceed for their Patents, together with the Disclaimers and Memoranda of Alterations filed under the Act from the 1st October, 1852, to the 30th June, 1855.

2. Fire-arms, Projectiles, &c. The entire series of Specifications and Drawings on this subject from the earliest period to the present time.

3. Reaping Machines. The entire series of Specifications and Drawings on this subject, with an Appendix.

4. Structures and Apparatus employed in the Combustion of Fuel and in connection therewith. The entire series of Specifications and Drawings on this subject.

5. Propulsion of Vessels, &c. The entire series of Specifications and Drawings on this subject from the earliest period to the present time.

6. A Miscellaneous Collection of Specifications of Patents enrolled under the old law; printed from time to time, to be used in evidence in Courts of Law.

JOURNAL.

The Commissioners of Patents Journal, from its commencement, January, 1854, to the present day, the numbers for 1854 being bound in one volume, with an Index.

This Journal is published on the evenings of Tuesday and Friday in each week, and contains the following information:

1. Grants of Provisional Protection for Six Months.

2. Inventions protected for Six Months, on Deposit of a Complete Specification.

3. Notices to Proceed for Patent.

4. Patents Sealed.

5. Patents Extended.

6. List of Foreign Patents.

7. Official Advertisements and various Notices.

The balance sheet (1854) shows an expenditure of £42,208 6*s*. 9*d*. on account of printing and lithographic drawing, as compared to £10,831 10*s*. 2*d*. expended in the year 1853; the explanation of the apparent excess in 1854 is, that the work of printing the Specifications of 1852-3 was not commenced until September, 1853, and that the arrear was overcome in the course of the year 1854. The sum of £53,039 16*s*. 11*d*. having been expended in printing, from the 1st October, 1852, to the 30th December, 1854, two years and one-fourth of a year, is equal to an annual expenditure of £23,573 5*s*. 4*d*.

The expenditure for the current year (1855) is estimated at £30,000, of which sum it is calculated not more than £12,000, will be expended in printing the specifications, indexes, &c., of the year, leaving £18,000, or thereabouts, to be expended in the work of printing the specifications enrolled previously to the Act of 1852.

The old specifications number 12,977; of these 1,526 have already been printed, and as it is proposed to print at the rate of 2,000 in each succeeding year, the work will be completed in six years or thereabouts, and the annual expenditure of £18,000 on this account will then cease.

The contract prices for lithographic printing having been lowered, and the number of copies now printed of each specification being 250 instead of 500 as formerly, the expenditure in respect of printing has been considerably reduced.

The work now in progress in the printing of the old specifications, is the whole subject of steam engines, those applicable to the propulsion of vessels having been already printed; when this subject shall have been completed, it is intended to commence the subject of the machinery for the manufacture of textile fabrics.

The Commissioners have transmitted the prints of specifications, indexes of patents, and all other papers printed by them to the chief magistrates and corporations of the principal towns within the United Kingdom, to be placed in such public free libraries as may now exist, or may hereafter be formed for the purpose, upon the following conditions:

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A librarian to be appointed to take charge of the works, who shall be held answerable for their safety and condition.

The works to be deposited in a public free library of the town, and to be open to the inspection of the public at all reasonable hours.

No charge to be made, or fee of any kind to be taken, on any pretence whatsoever, for the inspection, reading, or taking notes from any of the works.

No work to be lent to any person, or removed from the library, except for binding or necessary repairs.

The Commissioners recommend that the letter-press part of the Specifications be bound in volumes apart from the drawings, and the drawings be mounted on cloth and also bound in volumes.

The prints have been received by the several towns subject to the above-mentioned conditions, and in many of the large towns the gift has laid the foundation of free libraries, no such libraries having previously existed—the prints in continuation will be forwarded every succeeding Monday.

The Commissioners have established a public free library of research within the Patent Office, in Southampton-buidings. Convenient rooms are provided for the purpose, and the library is open to the public from 10 to 4 every day.

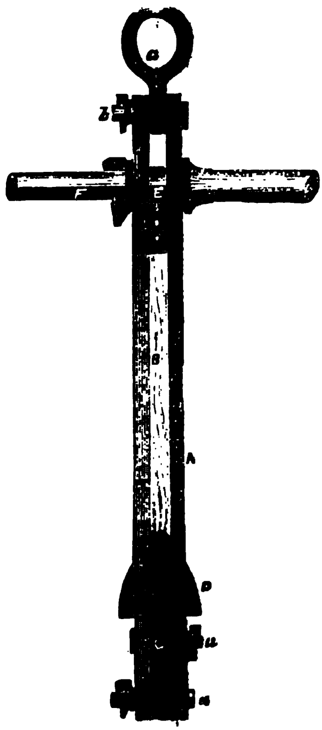
SCOTT'S PATENT ANCHORS.

Mr. J. Scott, of Sunderland, has patented during the present year an improved method of constructing anchors, in which, with a given quantity of metal, greater strength is obtained than in the ordinary construction; while the parts of the anchor are so formed and combined that they may be easily forged, and readily put together or taken to pieces, in consequence of which they are very portable, and capable of being stowed with great convenience.

The shank of this improved anchor is formed of two plates of iron, or other metal, kept apart throughout the whole or a portion only of their length, by means of a filling piece of wood or other suitable material, or by means of suitable enlarged portions of the plates themselves. The shank is united to the arms either by a forelock pin or pins, or by clinched bolts, or by screw bolts, according as the arms are intended to be movable about a centre or otherwise. When the filling piece is used a metal collar is made to embrace the two plates, and the filling piece which forms the shank, for the purpose of combining them more effectually at their junction with the arms, which may be made flat and of a uniform thickness, or of any other desired form.

Fig. 1 of the accompanying engravings represents a side view of an anchor constructed with a filling piece of wood, as

Fig. 1.

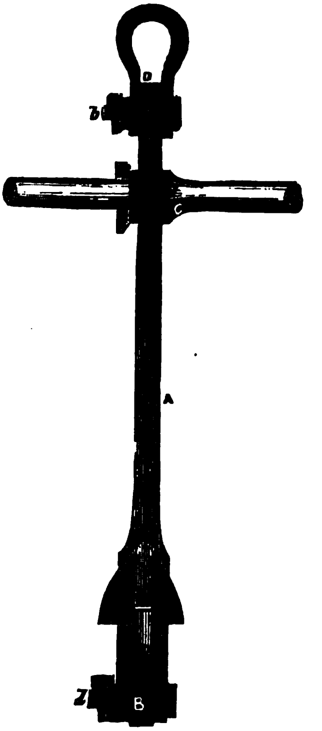


above described. A A are the side plates, and B is the wooden filling piece of which the shank is composed; C C, are the arms of the anchor. The shank, A, B, A, is in this case united to the arms, C C, by two forelocked pins or bolts, *a a*. D is the metal collar, which embraces the plates, A A, and the filling-piece, B, for the purpose of combining them more effectually, as has been described. A metal brace, E, attached to the other end of the filling-piece, B, has formed in it a hole, through which, as also through the plates, A A, the stock, F, passes, this stock being forelocked in the usual manner. The swivel, G, to which the cable is attached, is embraced by the two plates, A A, and united to them by a forelocked pin, *b*.

Fig. 2 represents a side view of another anchor, in which the side plates of iron are

kept partially apart by means of suitable enlarged portions of the plates themselves, this arrangement being preferred to the former. A A, are the two side plates, and

Fig. 2.



on these are formed the projections, *a a*, which come together at the middle line of the shank; B B, are the arms of the anchor. The shank, A A, is in this case united to the arms, B B, by a single forelocked pin or bolt, *d*, about which the arms are intended to turn, as in Porter's and other anchors. In this case the metal collar employed in the anchor first described may be dispensed with, or retained, as is considered desirable. The stock, C, passes through the two side plates, A A, as shown, and is forelocked, as usual. The swivel, D, to which the cable is attached, embraces the side plates, and is united to them by a forelocked pin, *b*.

POSITION OF SCIENCE IN ENGLAND.

A Parliamentary Committee of the British Association for the Advancement of Science having been appointed to inquire "whether any measures could be adopted by the Government or Parliament that would improve the position of Science or its cultivators in this country," has embodied the results of its inquiries among men of science in a Report which will shortly be presented to the members of the Association at their meeting in Glasgow. The suggestions they think deserving of the serious and earnest attention of Government, Parliament, and the Universities, and which the Committee term their desiderata, are summed up in the following propositions:

1st. That reforms shall take place gradually in the system of any of our Universities which do not at present exact a certain proficiency in physical science as a condition preliminary to obtaining a degree.

2ndly. That the number of professors of physical science at the Universities shall be increased, where necessary; but that at all events, by a redistribution of subjects, or other arrangements, provision should be made for effectually teaching all the various branches of physical science.

3rdly. That professors and local teachers shall be appointed to give lectures on science in the chief provincial towns, for whose use philosophical apparatus shall be provided; and that arrangements shall be made for testing by examination the proficiency of those who attend such lectures.

4thly. That the formation of museums and public libraries in such towns, open to all classes, shall be encouraged and assisted in like manner as aid is now given to instruction in the principles of art; that all imposts shall by degrees be abolished that impede the diffusion of scientific knowledge; and such donations of national publications be made as above mentioned.

5thly. That more encouragement shall be given, by fellowships, increased salaries to professors, and other rewards, to the study of physical science.

6thly. That an alteration shall be made in the present system of bestowing pensions; some annuities in the nature of good-service pensions be granted; and additional aid be given to the prosecution, reduction, and publication of scientific researches.

7thly. That an appropriate building, in some central situation in London, shall be provided at the cost of the nation, in which the principal scientific societies may be located together.

8thly. That scientific offices shall be placed more nearly on a level, in respect to salary, with such other civil appointments as are an object of ambition to highly educated men; that the officers themselves shall be emancipated from all such interference as is calculated to obstruct the zealous performance of their duties; and that new sci-

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entific offices shall be created in some cases in which they are required.

9thly. That facilities shall be given for transmitting and receiving scientific publications to and from our colonies and foreign parts.

10thly, and lastly. That a Board of Science shall be constituted, composed partly of persons holding offices under the Crown, and partly of men of the highest eminence in science, which shall have the control and expenditure of the greater part at least of the public funds given for its advancement and encouragement; shall originate applications for pecuniary or other aid to science, and generally perform such functions as are above described, together with such others as Government or Parliament may think fit to impose upon it.

It will be observed, that the majority of the above desiderata may be described rather as suggestions on behalf of national education than as privileges to be conferred on science. Three of the propositions, however, the 6th, 7th, and 8th, involve the establishment of privileges and rewards not now enjoyed by those who make science either their profession or pursuit. Still, it must be borne in mind that the encouragement thereby afforded to the cultivation of science, and not the boon to the individual, is the principal object in view.

The 10th proposition, the establishment of the Board, is not advocated as a means of increasing privileges and emoluments, but as the best mode of accomplishing an important national object.

Of the value of science no one surely can doubt who has received any mental training worthy of the name of education; and, notwithstanding any seeming indifference to an object of such vital importance, we believe that a feeling does pervade the community at large, that our country's welfare, and even safety, depend upon its due encouragement and fostering; and this is evidenced by the readiness with which the House of Commons accedes to demands, when made on its behalf. Owing, however, to the system which prevails in this country, of each successive government striving to outvie its predecessors in popularity by the reduction of public burdens, there is a temptation sometimes to withhold grants which may swell the total outlay of departments in which reductions are contemplated. This it is more particularly which, in the opinion of the Committee, renders the creation of the new Board, or some analogous measure, necessary.

THE SOLICITOR-GENERAL.

NEARLY two years since, in instancing a conspicuous case of . . . . . on the part of Sir R. Bethell, Her Majesty's Solicitor-General in the Governments of Lords Aberdeen and Palmerston, we took occasion to remark that the decisions of that officer in patent cases had produced great and repeated dissatisfaction. Since that period fresh occasions of discontent have so frequently presented themselves, that a very strong and general feeling against that functionary now exists in the mind of the public. This feeling is finding expression in the public journals, having been greatly strengthened by the recent unseemly attacks made by him in the House of Commons upon the Lord Chancellor, and the Lords associated with him in the hearing of appeals. The *Morning Herald* of Thursday, August 16th, directs attention, in a leading article, to the general conduct of the Solicitor-General, and, after effectively vindicating the Chancellor and Lord Brougham, concludes by urging upon Lord Palmerston the necessity of intimating to Sir R. Bethell that he is anxious to accept his resignation. The leading morning paper of Scotland, the *Caledonian Mercury*, writes upon the subject as follows:—

"The differences between the Lord Chancellor and the Solicitor-General may be said to have come to a head on Tuesday. The House of Lords sat that morning upon appeals; and after the Lord Chancellor had delivered judgment, and before their Lordships had taken upon themselves their legislative capacity, Lord St. Leonards, addressing himself as much to counsel at the bar as to the two or three lay peers present, complained of certain remarks recently made by Sir R. Bethell in the House of Commons, impugning the mode in which appeals were conducted in the House of Peers, which he had said could hardly be paralleled in any of the inferior tribunals. The Solicitor-General had complained that frequently only two law Lords (the Lord Chancellor and the Lord St. Leonards) were present, and that one of these Peers went out of the House and returned without attending to the argument of counsel, and considered himself privileged to listen or not, as if he were present at a debate. Lord St. Leonards warmly denied the accuracy of these statements, declared that he gave the most conscientious attention to everything that was said by counsel, and that if he left the house for a few minutes he took care to consult an accurate report of what had been said during his absence. Lord Campbell followed, and spoke very strongly against the Solicitor-General for endeavouring to shake public confidence in the administra-

tion of justice in that House. He said he considered that he had made an attack upon the Lord Chancellor, and it seemed as if he were of opinion that justice would never be properly administered in the House of Lords until he (the Solicitor-General) sat upon the woolsack. The Lord Chancellor said his Hon. and learned friend had a right, if he chose, to impugn the system of hearing appeals in the House of Lords; but he had made a most unfounded attack upon himself and Lord St. Leonards. The Lord Chancellor defended, at some length and with much warmth, the course taken by Lord St. Leonards and himself. When only two law Lords sit in appeal cases, and they differ in opinion, the judgment of the court below is affirmed. The Lord Chancellor admitted that this was not very satisfactory to the suitor, who might suppose that if another law Lord had been present the judgment of the inferior tribunal would have been reversed. Whispers of differences of opinion between the Lord Chancellor and the Solicitor-General have been rife throughout the session, and the want of cordial co-operation between these legal functionaries has, in the opinion of Lord Lyndhurst, been the cause that nothing in the way of law reform has been accomplished during the session. The Solicitor-General certainly looks with some impatience towards the woolsack; but the Lord Chancellor is full of health and vigour, and manifests no disposition whatever to retire."

Whatever the motives may be which induce a law officer of the Crown to act as above related, there can be but little doubt, if his immediate superiors are liable to be assailed as described, that inventors who have, in many instances, no appeal from his decisions, are in danger of being exposed to contempt and injury. And such is found to be actually the case; and we feel called upon thus publicly to direct attention, on behalf of patentees generally, to the dissatisfaction that prevails among them upon this subject. If it be true, as is currently believed, that the conduct of the Solicitor-General is to be attributed to a restless desire of reaching the woolsack, we are perfectly sure that he has the wishes of multitudes against him, and are equally confident that his attainment of that dignity would be greatly deplored by all classes, both legal and lay.

MR. WOODCROFT'S "STEAM NAVIGATION."

In our last number, page 149, first column, foot-note 12, Mr. T. Prosser, the author of the "Rough Notes about Ocean Steamers," is made to speak of a lecture by Mr. *Sargent*, as "remarkable only for the quotation of the stilted rubbish of such an author as Mr. Bennett Woodcroft;" in the MS. the passage runs thus: "remarkable only for the quotation of the stilted rubbish (contained in it) *by* such an author," &c. The change of the "of" into "by," which was not observed before going to press, has had the effect of propagating an injurious reflection upon Mr. Woodcroft's work—a work which is very highly and deservedly esteemed. We make the correction thus prominently, in order effectually to remove any false impression which the perusal of our last week's number may have occasioned, and the existence of which we should much regret.

THE PROJECTILE CONTROVERSY.

To the Editor of the Mechanics' Magazine.

Sir,—The reference made by your correspondent, Mr. Mushet, to my "Notæ Mathematicæ," has induced me to examine some of the letters lately published in your Journal on the "Long Range" and "Vertical Fire." There seems to me to be a good deal of misapprehension mixed up with the subject, and I have been tempted to think that a little more reading ought to be indulged in before the *practicians* venture to call in question the deductions of the *mathematicians*. "A Mechanic" has indeed been found both able and willing to break a lance in defence of the latter; and with your permission I will endeavour to point out one or two of the more prominent mistakes of the former.

1. There is a wide difference of meaning between the "Parabolic Theory of Projectiles" and the "Practice of Gunnery." In the former the resistance of the atmosphere is neglected, and gravity is supposed to be constant, and to act in parallel lines, whilst in the latter all the actual circumstances of the case are taken into account. Your correspondents would do well to consult the *Penny Cyclopædia* on these points, or indeed any treatise on gunnery; and I am of opinion that they will soon find they have been confounding two very distinct things.

2. Sir John Herschel's illustrations are quite correct on his own hypothesis. He supposes the resistance of the atmosphere to be neglected, and the surface of the earth to be as on still water. It is then merely a property of the "old parabolic theory," that the angles of ascent and descent are equal; for a perpendicular from the highest point of the curve will bisect the range, and the tangents at its extremities will make equal angles with the earth's radius. The Newtonian theory of the planetary motions is based upon the

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same neglect of the resistance of any atmosphere or ether; and hence I cannot see why either *Herschel's Astronomy* or *Newton's Principia* ought to be quoted in any discussions on practical gunnery.

3. The "parabolic theory" is never taught except as a *mathematical exercise* in our schools and colleges. It is on no occasion stated as affording anything more than a very rough approximation to the *true* path of a projectile in the most simple cases; but if a "Civil Engineer" desires to see the discussion as applied to a more general case, he will find it well illustrated by Professor De Morgan in the *Penny Cyclopædia*, and that, too, under a form very nearly similar to the favourite "old figure of the pump diagram."

4. Had Mr. Mushet read Newton instead of Lagrange, I apprehend he would have found little difficulty in believing that the process of continually cutting off the corners from a square and all the angular figures thus produced will *ultimately* realize a figure differing from a circle by less than any assignable quantity; and, for my own part, I must confess that I see no difficulty in changing an *ellipse into a parabola* by supposing the distance between the centre and the focus to become infinite, and *vice versâ*. When all the circumstances of a case are known to a mathematician the results of his symbols are always in accordance with *practice*. It is only when he is not able to take all the conditions into account that any discrepancy arises; and it is scarcely fair to hold his investigations up to ridicule and contempt when his reasonings are misapprehended, his hypotheses overlooked, or his results compared with others obtained from different or perhaps more correct data. The discovery of Neptune affords a good reference to all who are tempted to decry mathematics; and I may add, that not long ago the Rev. Samuel Earnshaw, of Sheffield, *by means of mathematics* PREDICTED a result that *must* follow on the undulatory theory of light, which was found by Professor Powell to be the *fact* when tested by experiment.

Assuring your correspondent, that my "Notæ" shall follow each other as often as leisure will permit,

I remain, Sir, yours, &c.,

T. T. WILKINSON.

Burnley, August 16, 1855.

[The above letter did not reach us in time for insertion in our last Number.]

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Hopkins has, it appears, taken upon himself the office of Moderator, or Chairman, in this so-called discussion. I can express no gratification at seeing the author of the extract appended to "Civil Engineer's" former letter assume airs of superiority in the present correspondence. Very little good can, in my opinion, proceed from a dispute conducted under such presidency. Mr. Hopkins does not seem exactly the individual to keep the disputant from becoming "bewildered in labyrinths of unmeaning expressions." My last letter is regarded as irrelevant. Let me remind Mr. Hopkins that it was an answer, not to a part of "Civil Engineer's" letter, but to the whole of it. My observations, however impertinent to what Mr. Hopkins may conceive to be the matter in dispute, were certainly not so to the statement of "Civil Engineer," but followed them one by one. I have not much to say in answer to the advancements of Mr. Hopkins himself, as there is very little in his letter requiring my notice. What I have to say, will no doubt be regarded by him as totally beside the mark. But then, as I shall speak of nothing which he has not introduced already, his probable estimate of my remarks will afford the best possible proof that I can offer him of how little anything he has said has to do with even his own ideas of the subject about which he imagines himself to be writing.

Having thus glanced at his introductory observations, I proceed to the fourth and fifth paragraphs of his letter, where there is the same kind of mistake made as I remarked in the former letter of "Civil Engineer." He makes a very questionable statement, imagining it to benefit his own views; while, if correct, it would in reality have quite the opposite effect. That mathematicians should have, ages ago, constructed formulas for the calculation of the periods of eclipses, &c., the results of which have been found equally consistent with facts, while the physical hypotheses connecting those facts underwent varieties of changes, should increase and not diminish our confidence in mathematicians.

The next paragraph is on the difficulty of lunar theory. For my own part, I have no doubt Dr. Whewell is right; and if Mr. Hopkins believes so too, let us agree not to meddle with it, for it is not likely we shall simplify it much. I do not expect that this proposition will be exactly to the taste of my opponent, since both in his book and in his letter he has shown himself not careful to avoid speculating on those subjects, concerning which he is wholly uninformed. His knowledge of the theory of projectiles, as taught by mathematicians, is plainly on a par with that of "Civil Engineer," and no more than can be gathered from a popu-

lar work on astronomy. Persons with such insignificant acquaintance with the subject, though they are the readiest, are not the most capable of taking part in a scientific discussion.

To the concluding sentence of this paragraph permit me to say that I promised no observations on his work. If the extract regarding which I undertook to say something may be taken as a fair sample, I should prefer not to engage to read any more of it.

The last paragraph of his letter is to me in great part enigmatical. However, I have not the slightest intention of pursuing the subject in the way advised by Mr. Hopkins.

But I must now turn to the last letter of "Civil Engineer." "Civil Engineer" seems to lie under one important disadvantage with regard to this dispute. He gives no proof in his letters of knowing anything either about theory or practice. And in the present instance he is replying to statements which nobody has made. With this letter I adopt my usual plan, and comment on it sentence by sentence as it is written.

I am not surprised that my allusion to the discovery of the planet Neptune has caused regret, as no doubt "Civil Engineer" would find it a difficult thing to turn to his own account. I do not *assert* that any merely *assumed theories* are worth any respect whatever, much less have I attempted to prove it. I regard every theory which is not founded in and consistent with fact as worse than useless; and this is why I esteem the *theories* advanced by "Civil Engineer" and Mr. Hopkins of such little worth. Let it be understood that the *theories* here spoken so much about are *the laws of motion*. These, of course, I am prepared to defend, if they are attacked. My position is, that these are accurate and adequate expressions of the whole of that class of facts to which they relate. They have been proved to be such by numberless observations and experiments.

I did *not* state that the discovery of Neptune had any connection at all with whether a projectile does or does not fall at an angle equal to that of projection. My statement was simple, true, and pertinent, so I shall not repeat it. But I will now, however, add, that the calculations made in reference to the discovery in question, depended on the truth of the same laws as are at the foundation of the solution of every problem in dynamics, so that if the deductions made by mathematicians from these laws, in reference to projectiles, be untrue, it must be because the laws themselves are false; and hence, if the calculations of mathematicians, in relation to bodies moving under the action of terrestrial gravitation are incorrect, then the discovery made by Mr. Adams was a mere fortuitous coincidence of circumstances. This, though different from, is consistent with what I said before. I must now pass to the third paragraph, and say that mathematicians do not confess their inability to solve the problem in question because it is not difficult. It is well known to persons acquainted with the subject, that the problem of curvilinear motion in a resisting medium, is peculiarly difficult; first, because the law of resistance is almost unknown; second, because no known method of analysis will touch the question under those conditions which seem to come nearest to the facts.

"Civil Engineer" apparently imagines there is some special argumentative efficacy in his use of the word *parallelogram*. He repeats that "practical experiments" have proved what he asserted in his former letter. Now I do not believe that "practical" or any other kind of experiments ever proved anything of the kind, and I am perfectly certain that Mr. Hopkins' parallelograms prove nothing at all that they are designed to establish. I requested "Civil Engineer," in my last letter, to detail the experiments which prove his position. He has not done so; I must therefore conclude that they are purely *theoretical experiments*—denizens of dreamland. I now ask him to favour the readers of the *Mechanics' Magazine* with what he considers the laws of physics. Without these laws, the next paragraph of his letter must remain to me a mystery; I can see no meaning in it. The final question is a puzzle only to himself, and no doubt will present the same difficulty whether the angles be supposed equal or unequal.

I now turn to the third of the four letters on this subject in your late number. The great point of this seems to lie in its subscription. None of the great things about which this correspondent asks rhetorical questions was ever effected by the *theories* of "practical men." Let us not use words without attaching some real and definite meaning to them. A theory in physics, I take it, is an hypothesis made to connect facts little known to others with which we are better acquainted. All great practical movements have been made by direct dealings with the facts themselves, and not by any such hypotheses. I do not desire to depreciate practical and mechanical men. I merely wish it to be remembered that there are and have been very many mathematicians possessing as much experience in matters of fact as the most eminent engineers of any time; and the views of such men are not to be sneered

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at as visionary and useless, by persons who have but the dimmest of perceptions of their nature, without my recording, in some way, my humble protest against such a proceeding. This present discussion will at least prove that theoretical men are not the *only* persons who write nonsense. This remark, naturally enough, brings me to the extract from Mr. Hopkins' book. I should be much pleased to know what are those "known principles of physics" with which everything is inconsistent. I must confess myself greatly puzzled to conceive what the author means, or whether he has a meaning.

In conclusion, my opponents have stated that mathematicians teach the doctrine that projectiles ascend and descend at equal angles. I say that they teach no such thing. What they do teach is, that if the atmosphere were removed and space immediately surrounding the earth made void, so that no force but that of the earth's attraction acted on the projected body, then the angles of ascent and descent would be equal. And this is of course a logical deduction from what most scientific *and practical* men regard as the known laws of physics. The variation from this in the actual case is due, they say, to the resistance of the air. These laws may be seen very neatly expressed in most elementary works on dynamics—Snowball's, for instance. Any objection to them I shall, as a matter of course, be very glad to answer, so far as I can, supposing always that they consist of something more than indiscriminate assertions.

That Herschel has stated this somewhat loosely, may be true, and if any one pleases to criticise him on that account, I have nothing to say. It is plain that the motion of the projectile is used by him to illustrate to his reader the possibility of continuous motion in a definite orbit about a centre of force. To the pertinence of this illustration, it is, of course, needful to imagine the air either absent or incapable of interfering with the motion. It is afterwards stated, as I have already pointed out, that the path of the body, under these imaginary conditions, does not coincide, even with any tolerable degree of approximation, with that observed in actual experiment. So he assigns the problems of practical gunnery to practical men, much to their discontent apparently.

Sir, I must not exhaust your indulgence, as I may desire it on a future occasion.

I am, Sir, yours, &c.,

A Mechanic.

EXPANSIVE MARINE ENGINES—IRON MANUFACTURE—LARGE SHIPS, &c.

To the Editor of the Mechanics' Magazine.

Sir,—I am glad to see Mr. Truran's sensible remarks on Mr. Allen's most elaborate paper. It is all in vain; for an attempt to introduce the cumbrous expansive engine of Cornwall, invaluable in its place, on board our steamers, must prove an abortive labour. Mr. Truran is a practical man, and has lately published, at Spon's, a very useful work on iron-making. It does not pretend to compete with the great French works of the same character; and I notice some antiquated matter, both in the plates and the letter-press; but, as a whole, it presents good information in a moderate compass. The sections of blast furnaces are an excellent feature, showing, in the celebrated Corbyn's-hall specimen, what is right, and, in its associates in the same plate, the slowness and imperfection with which what is right comes to be adopted. Mr. John Gibbons, in this furnace, developed on principle the vertical bosh, with the wide hearth and top, which have revolutionized the process of pig-iron making, a progress almost insensible and unacknowledged, because no patent was taken for the improvement. One great public value of a patent is as a record of the origin of inventions. For want of this we are often defeated in tracing back the origin of discoveries. There is nothing more useful and interesting than to know the steps of such a history from its earliest seeds, though it is seldom possible to discover them entirely; witness, for instance, the late remarks of Colonel Parlby on the origin of the rifle. The brother to the improver of the blast furnace, Mr. Benjamin Gibbons, has long since equally perfected a true system of ventilation for collieries, which might save our legislators a great deal of trouble; but, like all good things, "it must bide its time." Blast furnaces cannot be pulled down and rebuilt in a day; still less easy is it to immediately reform the labyrinths of collieries badly planned in the outset. Mr. Allen makes a trifling error in his first table, showing the theoretical gain by expansion. We know that in a geometrical progression, where two is the multiplier, the mean of two terms is always three-fourths of the larger term. The second column of power developed ought therefore to be 1·75 instead of 1·7, with a similar slight correction through the subsequent columns. The power developed by the increased heat of steam in ratio to pressure is also omitted. The table only represents the theory of a compressed fluid at a uniform temperature.

I cannot say I am surprised at the present activity in proposing imperfect applications of expansive steam in marine engines; they were to be anticipated, and are merely the substitution of positive for negative obstruction. I see Mr. Allen rather writes in the interest of the Eastern Steam Navigation Company; at least the proposed performance of their *Mammoth* ships is taken as one basis. These grand vessels own the same giant paternity as the Thames Tunnel, the Box Tunnel, the Nock Crib tunnel, unexecuted, the Devonshire atmospheric, and the late dividend of 2 per cent. on the Great Western Railway. I rejoice in the wealth of our country, which contributes so enormously to magnificent specimens of engineering skill. It is gratifying to see millions expended upon works of grandeur. The money is likewise beneficial to those who control and receive the expenditure. The Crystal Palace, for instance, has distributed a million and a quarter, and if the subscribers should never more receive a dividend, it is yet a great national feature. The only point on which I feel any doubt, is whether the subscribers, when led into these things, are entirely disinterested, without the least hope of advantage, and subscribe solely to patronise merit, and ornament the country, looking for no return to themselves. I remember, two years since, conversing about this great ship, with the officers of one of our first Navigation Company's vessels. What perplexed them was to conceive where a craft of 15,000 tons could, within any reasonable and profitable period, accumulate a cargo; "We find this steamer (of 1,800 tons)," said they, "quite large enough for that inconvenience." But the *Mammoth* may follow the noble *Himalaya*, and make an unsurpassed transport, if the war lasts long enough. Though fully appreciating the weighty matter of such great efforts, we may yet, while we do them, leave smaller matters not undone. The tithing of mint and cummin may prove profitable to the profit-seeking, whilst the wealthy disinterested are glorifying their country. Under that hope, I have been looking with interest for Mr. Wye Williams' promised exposition of the inapplicability of distilled water, and great saving of coal and weight, &c., &c., to the marine service. *Spargere ambiguas voces* is no part of Mr. Williams' exact and discriminating philosophy. When, therefore, in a letter, where he acknowledged with perfect candour he had made an erroneous criticism, he concluded by stating he had yet another error to point out, and would do so, I have been eager to see him vindicate his assertion, and prove that, if the first censure were a mistake, the second promise of censure appended to it, was not a mistake also. I am, Sir, yours, &c.,

DAVID MUSHET.

August 20, 1855.

CAPTAIN DISNEY'S FIRE-SHELL.

To the Editor of the Mechanics' Magazine.

SIR,—Having read in the paper of this morning that further experiments have been made with Captain Disney's liquid-fire, and that some apprehension was entertained lest the force of the explosion of a shell charged with it might so scatter the liquid as to destroy its incendiary effects, I beg to say that I can charge a shell with the liquid, and cause the shell to be fractured on striking boards, or even canvas, so that the liquid shall *spill*, and have full effect. I have explained my plan to Dr. Richardson, so that he can apply it to Mr. Scott's liquid-fire, which, I presume, is much of the nature of Captain Disney's; I am ready also practically to prove it to Captain D., if he will be so good as to afford me an opportunity.

I am, Sir, yours, &c.,

J. NORTON.

P.S.—A small glass vial filled with liquid, and having a wedge-formed stopper of wood fitted to it, and projecting about an inch, will, when attached to the flat head of an arrow, and shot against a loose flowing sheet of canvas hung from a rod, show the action of this shell, which bursts by the stopper being driven in by the resistance of the canvas, when the liquid pours out on the canvas, and whatever is beneath it.

Rosherville Hotel, Gravesend,
August 10, 1855.

PROJECTILES.

To the Editor of the Mechanics' Magazine.

SIR,—I have read with much pleasure Colonel Parlby on the flight of projectiles, but I cannot believe that he has come to a correct conclusion with regard to the proper shape of a projectile (something like a fish) to ensure a direct flight. There is, in my opinion, a great difference between a body of that shape being projected by the fins of a living fish, which are in constant motion, bending or resisting the medium through which the body passed, and a somewhat similarly shaped dead body projected through a tube by means of gunpowder, which only exerts its power for an instant; besides which, the wings of the projectile are immovable, and cannot therefore correct its flight, providing it does not leave the muzzle of the gun in a straight line. Moreover, it appears to me that no projectile would be more likely to deviate from a direct line than the one recommended by the Colonel. If it leave the

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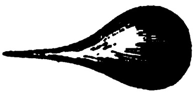
mouth of the gun with the least possible departure from a right line, how great will that deviation not be before it has reached 300 yards? Now, if we follow Nature's plan in something analogous to a projectile, and consider the shape which the swiftest bodies assume in traversing the heavens, we find them of a round form. I have often thought, though I may be wrong, that if a bullet were shaped thus



it would be a projectile least liable to deviate from a straight line. I am, Sir, yours, &c.,

J. I. LOCKHART.

London, August 20, 1855.

TUBULAR PASSAGE BETWEEN FRANCE AND ENGLAND.

To the Editor of the Mechanics' Magazine.

SIR,—The tubular passage between France and England, proposed by M. Favre, the French engineer, having been thought of sufficient interest to the public to have the paragraph respecting it copied in most of the papers of the day during this last week, I feel that I can put forward a claim to, at least, an earlier conception of the project, and which I have submitted to many of my friends and scientific gentlemen; and, amongst others, an esteemed county resident, who was much pleased with the idea, and, on the 18th of June, a few days after my interview, wrote me the letter which I now enclose, proposing to try the project between Scotland and Ireland, in the first instance, between Port Patrick and Domaghdee, which is about twenty miles. The same gentleman further wrote to his friend, Dr. Robertson, of the Observatory, Armagh, a great mechanic, and the extract of his opinion you will find in the gentleman's second letter, which says—"In these days of progress, it is unwise to say that any plan, however bold, is impossible, and, in this particular instance, I do not see any *insuperable difficulty*." M. Favre's plan being a tunnel *under* the bed of the Channel, does not, in reality, interfere with my plan of a tubular passage *on* the bed; and, as he does not seem to see his way to give ventilation, I may mention that my plan includes perfect ventilation. This is a curious part of the project; but the more difficult one of making the tubes to stand the pressure, joining them together in the water, and keeping them in place when joined, I must decline to enter upon in this letter; although I have these matters finally arranged, and shall be happy to meet any one interested in the project to carry them out. To patent the plans which, if known, might be generally adopted in crossing rivers, is not my intention, being entirely averse to any Patent Laws as at present in use.

I am, Sir, yours, &c.,

HENRY MULLINER.

Royal Carriage Manufactory,
Leamington Spa, Aug. 20.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the construction and arrangement of electric telegraphs, and in the application thereof.* (A communication from the Chevalier Gaetano Bonelli, of Turin, Sardinia, director general of Sardinian telegraphs.) Patent dated January 25, 1855. (No. 191.)

A description of this invention will be given hereafter.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, gentleman. *Improvements in machinery or apparatus for preparing cotton, and similar fibrous materials.* (A communication.) Patent dated January 25, 1855. (No. 192.)

Claim.—The system or mode of loosening, cleaning, and otherwise preparing the fibres of cotton and other fibrous materials, by the employment of a spiked drum or cylinder, revolving at a high velocity, the fibrous material being thrown off at the back of it by the centrifugal force of the same.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *A power accumulator or apparatus to be employed with hydraulic presses.* (A communication from Jean Baptiste Falguière, of Marseilles.) Patent dated January 25, 1855. (No. 194.)

This apparatus consists of two hollow and separate cylinders, in each of which a piston is free to move, each of which is loaded with a weight proportioned to the power to be obtained from each of them. One or other of these cylinders is placed at will in communication with the hydraulic press to be worked by means of pipes and cocks. That one in which there is the least pressure serves to commence the pressing operation, while the other carries the pressure to the maximum and terminates the operation. A sufficiently powerful pump injects water under the pistons and keeps them raised.

BINNS, WILLIAM, of Claremont-villa, Victoria-road, Brompton, Middlesex, consulting engineer, and JAMES HAUGHTON, of Bank-side, New Mill, Oldham, Lanca-

ter, engineer. *Certain improvements in valves for stopping, retarding, and regulating the flow of steam, water, or other fluids.* Patent dated January 26, 1855. (No. 197.)

In place of the ordinary or present construction of throttle valve, the inventors propose to employ that description of valve known as the "ventilator valve," in combination with an ordinary conical stop-valve, so as to form a compound stop and throttle valve, either of which may be used separately, if required.

BELL, GEORGE, of Cannon-street West, London, merchant. *Improvements in constructing air springs.* (A communication.) Patent dated January 26, 1855. (No. 199.)

This invention "consists in interposing a liquid substance between the confined air and a flexible substance by the bending of which the capacity of the containing vessel is increased or diminished, thereby effectually preventing all escape of air, either through the pores of the flexible substance or through the joints of the containing vessel."

LEESE, JOSEPH, junior, of Manchester, Lancaster, manufacturer. *Certain improvements in the process of printing calicoes and other textile fabrics.* Patent dated January 26, 1855. (No. 200.)

These improvements relate to the "resist" and consist in the recovery of the copper from the washings of the cloth, and from the acid solution which is used subsequently to remove it, and which has heretofore been considered waste.

VOSE, WILLIAM T., of Massachusetts, United States of America. *New and useful improvements in pumps for elevating fluids.* Patent dated January 26, 1855. (No. 201.)

These improvements consist in connecting two pump barrels at two adjacent ends, and in arranging the valves of their respective pistons so that one of them shall be applied to the upper side of one piston, while the other is applied to the opposite or lower side of the other piston. By applying the induction and eduction pipes respectively to the disconnected ends of the barrels a continuous flow of fluid is produced when the pumps are worked.

ATKIN, ISAAC, of Basford, and St. Mary's-place, Nottingham, lace manufacturer, and MARMADUKE MILLER, of Vernon-terrace, Nottingham, steam - gauge maker. *Improvements in apparatus for measuring the supply of water and regulating the supply of fluids.* Patent dated January 26, 1855. (No. 202.)

The apparatus described by the inventors comprises two vessels placed one within the other, the inner one having holes formed in its opposite ends, and from it proceeds the outlet pipe which has connected with it on one side a branch across which is a flexible partition or diaphragm of vulcanized India-rubber against which is a rod connected to a lever that supports and moves a valve-rod, and there is a coiled spring to the rod which prevents the diaphragm from being moved outwards, and according as this spring, or the length of the lever, is adjusted, the resistance offered to the diaphragm in moving outwards will vary in consequence of the rod acting on the lever and causing the valves more or less to close the openings. The quantity of water passing from the outlet is measured by means of a wheel in a cylinder into which the water flows from the outlet pipe of the regulating apparatus, and this wheel gives motion to a counting apparatus which records the number of revolutions of the wheel.

SCARBY, GEORGE, of Sloane-street, Chelsea, Middlesex. *Improvements in the manufacture of boots and shoes, also applicable to other articles made of or partly formed of leather.* Patent dated January 26, 1855. (No. 204.)

This invention consists in manufacturing seamless boots and shoes by stretching and currying the leather upon the last so that it is softened and worked to the required shape, after which it is drawn partly over the sole of the last or block, and fastened by tacks or pins.

MALLET, ROBERT, engineer, of Dublin, Ireland. *Improvements in the manufacture of hollow shot and shells, and similar hollow bodies of cast-iron or other cast metals.* Patent dated January 26, 1855. (No. 205.)

The inventor, when casting hollow bodies, instead of employing cores of loam or sand which are afterwards picked out, constructs a thin hollow core in two or more pieces of cast or wrought iron, and places this in the mould, pouring the melted iron around it. This hollow core is not afterwards removed, but remains as a lining.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the construction of kites, and in the application thereof to the purposes of carrying lines and of signalling.* (A communication.) Patent dated January 26, 1855. (No. 206.)

This invention comprises a mode of constructing kites so as to render them capable of being easily folded up or extended when required; a peculiar construction and arrangement of the belly bands of kites, whereby the main cord may be attached at different points, according to the strength of the wind; the application and use of a float attached to kites, whereby they may be enabled to travel in an oblique direction with the wind; &c.

HUTCHINSON, JOHN, of Longroyd-bridge, Huddersfield, York, engineer. *Improvements*

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in apparatus to economize steam. Patent dated January 27, 1855. (No. 207.)

Claim.—The application and use of a tap, the inlet end or orifice of which extends below the exit orifice, compound levers, and float-ball.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *An improved machine for manufacturing thimbles employed on board ship or elsewhere.* (A communication.) Patent dated January 27, 1855. (No. 211.)

In carrying out this invention the iron plate of which the thimble is to be made is rolled round a mandril of a suitable form, by means of a roller worked by a lever.

NIGHTINGALE, HENRY, of Chorley, Lancaster, manager, and ROBERT NIGHTINGALE, of the same place, grocer. *Improvements in machinery or apparatus for slubbing, roving, and spinning cotton and other fibrous materials.* Patent dated January 27, 1855. (No. 212.)

Claims.—1. The application and use of flyers detached from their spindles, and working in suitable bearings in fixed overhead brackets secured to the roller-beam, or to any other suitable portion of the machine, whether the same be applied to slubbing, roving, or other spinning-frames. 2. The application and use of fixed studs or pins for holding the bobbins in slubbing, roving, and other spinning-machines, in place of revolving spindles.

POLKINHORN, WILLIAM, of Gwennap, near Redruth, Cornwall, miller. *Improvements in apparatus for cleansing wheat.* Patent dated January 29, 1855. (No. 215.)

The inventor describes an apparatus in which, upon the stone being caused to revolve, the wheat is subjected to a frictional process between the stone and the rough lining of a receptacle or box, "such process being of such a character," says the inventor, "that no portion can escape its influence, and whereby the brush end of the grain will be detached, together with all filth, whether smut, dirt, grit, or other impurities, while the wheat itself is not broken, and receives no injury."

DORMOY, HENRI LOUIS, gentleman, of Paris, French Empire. *Certain improvements in braiding or plaiting-machinery.* (A communication.) Patent dated January 29, 1855. (No. 216.)

The machinery described by the patentee comprises cams or eccentrics for giving motion to parts of the machine,—certain instruments acting somewhat in the manner of hands,—a series of hollow spindles or bobbin holders which circulate in serpentine or undulating paths, so as to interlace the threads,—a lever or bar with a hook which carries the threads on to another hooked bar or receiver, combined with a spring knife or shears for cutting the cops of the fringe,—and certain combs or pins for forming the edge, and for pressing upon the work, and preventing it from being drawn forward.

HUMPHREYS, JOHN DODDRIDGE, of Charlotte-street, Caledonian-road. *Improvements in steam engines.* Patent dated January 29, 1855. (No. 217.)

In carrying out this invention, two trunk engines are combined in their action, in such manner that high pressure steam is first used on the lesser area of the piston in the smaller cylinder, then on the larger area of the same piston, then on the smaller area of the piston in the larger cylinder, and then on the larger area of the last mentioned piston.

TURRAY, JOHN, of Bridge-road, Lambeth, Surrey, engineer. *Improvements in locks.* Patent dated January 29, 1855. (No. 218.)

The case of this improved lock has each side perforated by a round hole to admit the proper key, and on the inner side of each hole is a circular recess to admit a boss or rotating tumbler. The bolt has on its edge next the key-hole two circular hollows, so situated that at either extremity of its throw one of the bosses can fit into the hollow, and thereby prevent the bolt from sliding. This boss has one part of its circumference cut off, and this, being presented to the bolt, allows it to slide. The same boss has one tooth, and the bolt has two projecting teeth near its farther edge. The other boss has an arm, on which is mounted a pinion free to revolve, and capable of gearing with the tooth on the boss, or the teeth on the bolt. Each boss is perforated by a hole of any but a circular form, and the key is a spindle with two collars near its point suited to the holes in the bosses, so that when the key is inserted they can both be turned by it; and they are so adjusted that when the key is turned the pinion gears with the tooth on the boss and the teeth on the bolt at the same time, and being thus prevented from turning on its own axis, throws the bolt its proper distance.

COLLINGE, ARTHUR, of Bridge-road, Lambeth, Surrey, engineer. *Improvements in spring-hinges.* Patent dated January 29, 1855. (No. 220.)

The inventor employs an apparatus of such a character, that when the door to which it is applied is moved out of its middle or closed position, a centre spindle and a horizontal arm revolve with it, and a roller running along the inclined surface is forced towards the centre and compresses the spring; but when force is no longer applied, the compressed spring forcing the

roller against the inclined curved surface causes it to run towards the middle position, thereby turning the centre spindle and with it the door back to its closed position.

BINKS, THOMAS, of Wentworth, York, plumber and glazier. *Improvements in raising and regulating the supply of water and other fluids.* Patent dated January 29, 1855. (No. 221.)

Claims—1. A general arrangement and construction of apparatus. 2. The application and use of pumps, fitted with a closed top having a sunk cup or guide cast thereon or fitted thereto. 3. The application and use of earthenware pipes for pumps of all kinds. 4. The application and use of air-vessels, for pumps, rams, and other similar purposes, composed entirely of earthenware. 5. The application and use of air-vessels composed of earthenware or other suitable material, adapted to lift, and lift and force pumps as described. 6. A certain described construction and arrangement of buckets and valves for pumps. 7. The application of a porous stone filter to pumps, &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in looms for weaving.* (A communication.) Patent dated January 29, 1855. (No. 222.)

This invention relates to an improved construction and arrangement of mechanism for actuating the drop-boxes of looms, and consists in elevating the drop-box by means of a knife edge, and hook or bolt, which are brought into connection with each other when the drop-box is to be elevated.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the generation of steam.* A communication. Patent dated January 29, 1855. (No. 223.)

This invention comprises an arrangement of apparatus for drying and dilating or super-heating steam—a mode of super-heating the steam before it enters the cylinders, by first drying it in a coil or coils of drying-pipes, and subsequently dilating it in a coil or coils of pipes placed in immediate contact with the flames issuing from the furnace—the use of certain evaporators composed of a great number of small copper tubes, opening into suitable chambers, and contained in a casing surrounded by water, &c.

MOLINE, DAVID, of Adelaide-place, London, merchant. *Improvements in the manufacture of metallic window-frames and skylights.* (A communication.) Patent dated January 30, 1855. (No. 227.)

Claim.—The manufacture of metallic window-frames and skylights, by uniting a series of metallic bars, by placing them in suitable metallic or other moulds, and casting metallic bosses at the junctions or intersections of the bars.

HENRI, GEORGE WILLIAM, of Fishergate, York. *A new compound of meal mixture for feeding cattle.* Patent dated January 30, 1855. (No. 230.)

This invention consists in imparting to prepared food or meal employed for feeding cattle the bitter properties contained in young grass or tares, and other green herbage, or unripe corn, at the spring time of the year, "such properties having been found as beneficial to herbivorous animals as salt is to them in stimulating the stomach and digestive organs to healthy action."

POCHIN, HENRY DAVIS, of Salford, Lancaster, of the firm of Halliday, Pochin, and Co., manufacturing chemists. *Improvements in the treatment of certain compounds of alumina, and the application of the same in printing, dyeing, tawing, paper-making, and such like purposes.* Patent dated January 30, 1855. (No. 231.)

In carrying out this invention, clay composed of about 45 parts of silica, 37 of alumina, ·3 of oxide of iron, and 17·7 of water, is ground to powder, heated for about two hours, being kept well stirred until all the water is evaporated, and then passed through a fine sieve of about 80 meshes to the square inch. One ton of it is then intimately mixed with 21 cwt. of sulphuric acid having a specific gravity of about 17·35, and afterwards as much water is added as would reduce the specific gravity of the sulphuric acid employed to about 1350. It is then placed in a leaden or other suitable vessel and steam or fire heat applied, being well agitated until it reaches a temperature of 212° Fahrenheit, when the greater part of the sulphuric acid combines with the alumina of the clay, causing a violent action. It is then retained at a boiling temperature for about four hours, so as to insure the combination of the whole of the acid with the alumina, after which the fire is withdrawn, the mass removed and cooled, and the aluminous coke retained.

SMITH, JOHN, of Langley Mills, Brancepeth, paper manufacturer, and JAMES HOLLINGWORTH, of the same place, both in Durham, manager. *Improvements in treating certain fibrous materials for manufacturing paper.* Patent dated January 31, 1855. (No. 233.)

This invention consists "in washing out from the materials the chlorine gas with warm water, the boiling of the gas-bleached materials in sulphite of soda and alkali, or soda ash, and the employment of sulphuric acid after washing out the gas before boiling the materials in alkaline solutions."

LYON, ARTHUR, of Windmill-street, Finsbury, Middlesex, sausage-machine manu-

[redacted]

facturer. *An improvement in sausage-making or mincing machines.* Patent dated January 31, 1855. (No. 234.)

This invention consists in lining the interior of suasage-making and mincing machines, also the barrel, with tin or other white metal.

PRICE, GEORGE, of Wolverhampton, Stafford, manufacturer. *Improvements in iron safes, chests, and boxes.* Patent dated January 31, 1855. (No. 236.)

This invention consists—1. In painting the interior of the chambers in which materials are placed for generating steam (when the safe is acted upon by fire) with a mineral paint or composition, to hinder chemical action. 2. In case-hardening the interior and other parts of safes. 3. In forming those parts of the lock case of safes, &c., which are not occupied by the works of the lock, and those parts of the door in which the bolts work, of a reticulated or honey-comb structure, so as to prevent the introduction of gunpowder into the said parts, except in quantities too small to do damage.

HOWARD, JAMES, of Bedford, agricultural implement maker. *Improvements in ploughs.* Patent dated January 31, 1855. (No. 237.)

This invention consists in constructing hollow plough frames, by bolting together plates or sheets of metal, "or in any analogous manner which will permit of the requisite amount of rigidity and lightness being obtained," and in a mode of simplyfying the connection of the share lever with the plough frame.

DELOUEY-MALAVAS, JACQUES ROUX, gentleman, of Monbrison, France. *Improved machinery for obtaining and applying motive power.* Patent dated January 31, 1855. (No. 238.)

The principle upon which the machine described by the inventor is constructed is, he says, "founded upon the laws of gravity, and the power depends upon the difference which exists with the same weight according to whether it is brought nearer to or further from its point of gravitation"!

PORTER, FRANCIS, of Bessborough-street, civil engineer. *Improvements in the manufacture of bricks, and other articles of clay or brick earth.* Patent dated January 31, 1855. (No. 240.)

Claims.—1. The combination of the brick machine with pug-mill and feeding-chamber and apparatus, as described, to form an improved machine for the manufacture of bricks and other articles of clay or brick earth. 2. The constructing of shafts upon which knives or blades of any form are cast or fixed, having a core through the centre of such shafts, for the insertion of the driving spindle. 3. Certain movable plates forming part of the feeding chamber. 4. The insertion of the scrapers in the mouth-piece between the rollers and die, whereby the scraper is placed more tangentially with the surface of the rollers, and better secured by such insertion. 5. The employment of different metals in the construction of dies and the stops.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, Strand, London. *Improvements in machinery for forging nuts and washers.* (A communication.) Patent dated January 31, 1855. (No. 242.)

This invention comprises a method of cutting from a bar of metal a blank, and punching, compressing, or swedging the same into shape at one operation, by a described combination of parts—a method of instantly discharging the nut or washer from the die box in which it is formed by the backward stroke of the piston—the combination of a punch and dies with a piston driven by steam or compressed air, &c.

TAYLOR, WILLIAM, of Oxford-terrace, Hyde-park. *Improvements in cables for holding at anchor, and towing ships, and other floating bodies.* Patent dated February 1, 1855. (No. 243.)

This invention consists in constructing the links of the cable or of part of the cable of caoutchouc, or of a mixture of caoutchouc with another substance.

DIXON, THOMAS OXDEN, of Steeton, near Keighley, York, bobbin-manufacturer. *Improvements in machinery or apparatus for turning, boring, cutting, and shaping wood and similar materials.* Patent dated February 1, 1855. (No. 244.)

This invention consists—1. In the use of a hopper "in which the prepared blocks of wood or other materials are placed to supply a pair of rollers for taking hold of and carrying forward to suitably-formed dies, which receive and hold for a time successively one of the blocks of wood, whilst it is being operated upon by a cutter or cutters and a boring bit or drill, which are mounted on each end of a spindle having a duplex motion, rotary and reciprocatory, the latter by means of a lever and tappet, the wood being thus turned and bored at the same time, and on the withdrawal or return of the said spindle alternately a circular saw in rotation is caused to rise up, by means of a tappet, and cut off the part thus turned and bored or shaped, the operation being alternately performed at or by each end of the spindle." 2. In the use and application to bobbin-turning lathes of a rotatory spindle, carrying circular or other cutters capable of being arranged in form and size to the shape or configuration of bobbin required, the said spindle having an oscillating motion by

means of a tappet and lever, whereby bobbins or similar articles can be turned, cut, or shaped to the pattern or form required, when a catch or other suitable contrivance is acted upon by the said tappet, and liberates the bobbin or other article, and stops the lathe for re-supply.

PRINCE, ALEXANDER, of Trafalgar-square, Middlesex. *Improvements in fire-arms.* (A communication.) Patent dated February 1, 1855. (No. 245.)

This invention consists in adapting certain mechanism to the lock of a percussion fire-arm, and establishing a communication between such mechanism and that part of the stock of the fire-arm which supports the barrel, so as to form a channel in that part of the stock as a receptacle for percussion-caps; and the hammer is so arranged and connected to the mechanism employed for placing the percussion caps upon the nipple, that the cocking of the fire-arm shall actuate the mechanism, and effect the lifting up of a piece of metal containing one percussion cap, and cause it to place the same upon the nipple, and by the time that the hammer is full locked the piece of metal which previously contained the cap will have retired into its original position out of the way of the hammer, leaving the percussion cap upon the nipple.

JECKS, ISAAC, of Trowse Newton Lodge, near Norwich, Norfolk. *A machine for sweeping grass or weeds from lawns or fields, and depositing the same into a box or other receptacle.* Patent dated February 1, 1855. (No. 246.)

This machine is composed of a drum made of wire or rods, or bars of metal, and provided with fan blades, such drum being placed and made to revolve rapidly within a case or fan-box.

WILLIAMSON, ALEXANDER WILLIAM, of University College, Gower-street, Middlesex. *Improvements in apparatus for feeding fires.* Patent dated February 1, 1855. (No. 247.)

The inventor employs a shovel or scoop so constructed that when introduced below the ignited fuel it will displace or raise it, and leave a space below for the fresh fuel contained in a chamber at the back of the shovel to be forced by a plunger or piston from the chamber.

GOODFELLOW, BENJAMIN, of Hyde, Chester, engineer. *Improvements in ordnance.* Patent dated February 2, 1855. (No. 248.)

This invention consists—1. In materially increasing the weight of ordnance, in order to diminish the recoil, and to increase the force of the exploded powder or the projectile. 2. In an improved mode of connecting the parts of a piece of ordnance put together in two or more lengths. 3. In inserting bushes or tubes into pieces of ordnance to increase their strength and durability, and in inserting a bush or tube into each portion of a compound piece of ordnance, in order that when disconnected each portion may be employed as a gun of about the same range as the original piece, but of diminished bore. 4. In causing the powder to be ignited near its centre, and at more than one point at the same time.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WINSTANLEY, WILLIAM, and JOSEPH KELLY, of Liverpool, Lancaster, engineers. *Improvements in pump gear.* Application dated January 25, 1855. (No. 186.)

In carrying out this invention "a working rod or lever is placed in a horizontal direction, one end of it being jointed to the top of the pump-rod, and the other to a fixed axle (such as a horizontal bar fixed at a right angle thereto), upon which it can turn in a vertical direction. On each side of the horizontal working lever an antifriction wheel is placed, and these antifriction rollers are acted upon from below by two eccentric wheels or cams, keyed to the driving shaft which is placed at right angles to the horizontal working lever to which the antifriction rollers are attached."

POWELL, HENRY BUCKWORTH, of Foxleare-park, Lyndhurst. *An improved precautionary keel, to be applied to vessels when in shallow water or other, difficult navigation.* Application dated January 25, 1855. (No. 188.)

The inventor fits a metallic frame beneath the keel of vessels, which frame may be withdrawn by means of ropes or chains attached to it.

BURSILL, GEORGE HENRY, of Ranelagh-road, Thames-bank, Pimlico, engineer and assayer of minerals. *Improvements in cases or coverings for explosive substances or compounds.* Application dated January 25, 1855. (No. 193.)

The inventor covers the cases named in the title with paper in combination with gutta percha, caoutchouc, asphaltum, or other water-proof varnish or material.

TOWNSEND, WILLIAM, of Coventry, Warwick, machinist. *Constructing wheels without axletrees, and thus affording an improved method of lowering the body of the vehicle.* Application dated January 26, 1855. (No. 195.)

The inventor constructs vehicles with wheels fitted on fixed arms or axles attached to the bodies of the vehicles.

BEALES, WILLIAM, of Arlington-street, Camden-town, Middlesex, cartridge-maker.

[redacted]

Improvements in cartridges. Application dated January 26, 1855. (No. 198.)

This invention consists in manufacturing cartridge-cases of paper or fine woven fabric prepared with oil, so as to render it waterproof, and to cause it to give out grease to the barrel of the fire-arm in which it is used.

MORRIS, WILLIAM RICHARD, of Deptford, Kent, engineer to the Kent Water-works Company. *Improvements in the construction and arrangement of apparatus for preventing the waste of water from service-pipes or cisterns.* Application dated January 26, 1855. (No. 203.)

In using the apparatus described by the inventor for water-closets, the handle connected with a closet-box is elevated, and the box is raised with it. The level of the water in one division of the vessel being thereby lowered, in consequence of the reduced immersion of the closet-box, a rapid flow of water takes place from the other division through a hanging valve, and thereby allows to descend a buoyant supply-box, which opens the supply-valve or cock, and allows the water to pass into the closet.

ONION, WILLIAM, of Birmingham, Warwick, manufacturer. *An improvement or improvements in gas-stoves.* Application dated January 27, 1855. (No. 209.)

This invention consists in making the bodies of gas-stoves of clay or unglazed pottery ware.

DAVIS, ELIAS, of Aldgate, London, India-rubber manufacturer. *Improvements in rendering paper waterproof.* Application dated January 27, 1855. (No. 210.)

This invention refers to certain applications of India-rubber, gutta percha, and their compounds, with or without other ingredients, for rendering paper waterproof. The inventor applies these materials in thin sheets, or solutions of them, in suitable spirits or oils, and, when requisite, subjects the paper so prepared to a rolling or pressing process.

WILKINS, JOHN, commercial clerk, of New Charles-street, City-road, Middlesex. *An improved mode or method of damping or moistening postage, receipt, or other stamps, adhesive labels, the surface of paper, and other substances.* Application dated January 29, 1855. (No. 214.)

The apparatus described by the inventor has a reservoir containing a chamber into which the labels to be damped are placed, where they are damped by means of water pressed out of a ball or other vessel into the reservoir.

GOODFELLOW, GEORGE, of Great Fenton, Stoke-upon-Trent, Staffordshire Potteries. *Improvements in supplying heated air to the bottoms and flues of potters' and brickmakers' ovens and kilns, and of steam-engine boilers.* Application dated January 29, 1855. (No. 219.)

This invention has for its object means of applying heated air to the products of combustion passing from furnaces or fire-places. "For this purpose," says the inventor, "the air flues are constructed with reference to their receiving over them a quantity of broken fire bricks, broken 'saggers,' or such like matters, and the air flues are covered with such broken substances or matters. Such air flues are also arranged with or have applied thereto perforated pipes."

PICHOT, ALPHONSE, printer, of Poitiers, France. *Certain improvements in postage paper and envelopes.* Application dated January 29, 1855. (No. 224.)

This invention mainly consists in forming out of portions of sheets of paper lappets which, when the sheets are folded, combine to form envelopes.

DEATH, EPHRAIM, and JOHN POPPLEWELL, of Halstead, Essex, engineers. *An improved stop-valve or cock for water, gas, and other liquids and fluids.* Application dated January 29, 1855. (No. 225.)

This invention consists of a stop-valve or cock in which there is a spindle, one end of which carries a disc faced with vulcanized India-rubber or other suitable packing where necessary, the other end being screw-threaded, and having affixed to it at top a suitable handle. This screw works in a corresponding female screw cut in the head of the valve, and a seat is provided for the inner side of the disc, and a passage for liquid or fluid is opened or closed by moving the disc either way.

CUNNAH, EDWARD, brassfounder, and JOHN HAMPSON, time keeper, both of Liverpool, Lancaster. *Improved turnstile counting apparatus.* Application dated January 29, 1855. (No. 226.)

The clock or counting apparatus described by the inventors, is enclosed in a box to secure it from being tampered with, and is actuated directly from the central vertical shaft of the turnstile, on which is mounted a wheel or disc technically called a barrel. This barrel is provided on its upper side with four teeth or projections which prevent the counting apparatus from being damaged or turned except when necessary.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *An improved filter.* (A communication.) Application dated January 30, 1855. (No. 228.)

This improved filter consists of a layer or layers of cotton fibre or cotton waste, flax fibre, flax cotton, wool, or other like vegetable and mineral fibres placed and held be-

tween two perforated plates, frames, or sets of laths, or other suitable contrivance for confining the fibrous material.

WARREN, DAVID, of Glasgow, Lanark, engineer. *Improvements in screw propellers.* Application dated January 30, 1855. (No. 232.)

In carrying out this invention, the blade is shaped so that a section at right angles to the axial line of the shaft "will present an outline consisting of a portion of a parabola, having the quicker part of the curve towards the centre, and being drawn tangentially to the screw boss."

WHITE, STEPHEN, of Southport, Lancaster, gentleman. *Improvements in the manufacture of pencils or crayons.* Application dated January 31, 1855. (No. 235.)

The inventor prepares a cement for producing a crayon or pencil paste by taking two parts of the purest white olive oil soap, and one part of the purest picked gum arabic, and digesting them together with 21 parts of distilled water kept at a temperature of about 120° F. in a suitable covered vessel, frequently stirring them for some hours until perfectly dissolved; it is then to be strained through linen or fine muslin cloth whilst still warm, and coloured if desired. Crayons and pencils made from this paste are intended to produce indelible pictures.

SAMUELSON, MARTIN, and ALEXANDER SAMUELSON, of Scott-street Foundry, Hull, engineers and ship-builders. *Improvements in steam-engines.* Application dated January 31, 1855. (No. 239.)

When constructing steam-engines in which steam is allowed to escape from one cylinder into another, and expand in the latter, the inventors so arrange the steam pipe and apparatus connected therewith, and the condenser, that the high pressure steam may, when desired, be expanded in the low pressure cylinder, and then pass to the condenser; or at other times so that the steam from the boiler may pass into the high pressure cylinder and thence into the condenser, and the low pressure cylinder receive its steam direct from the boiler.

HARRINGTON, JOSIAH, of Pelham-street, Brompton, Middlesex. *Improvements in priming fire-arms.* Application dated January 31, 1855. (No. 241.)

This invention consists of a combination of apparatus which when put in motion by a movement of the trigger-guard, or other instrument in connection therewith, will put a detonating cap on to the nipple.

PROVISIONAL PROTECTIONS.

Dated August 2, 1855.

1748. John Stanley, mechanical engineer, of Whitechapel-road, Whitechapel, Middlesex. Improvements in weighing-machines, and weights used with the same, which improvements apply principally to weigh-bridges, weighing-cranes, and the class of weighing-machines acting upon levers, steel-yards, &c.

1750. Samson Woller, of Bradford, York, manufacturer, and Illingworth Butterfield, of the same place, manager. Improvements in machinery for weaving figured fabrics.

1752. Richard Albert Tilghman, of Philadelphia, United States of America, chemist. Improvements in the manufacture of candles.

Dated August 3, 1855.

1756. Joseph Lane, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of gold-leaf.

1758. Jean Baptiste Mourguet, of Paris. An apparatus for the destruction of the weevil, its larves and its eggs, whilst drying the corn, without injuring its ordinary properties.

1760. Frederick Robert Augustus Glover, of Endell-street, Middlesex, Master of Arts. Improvements in the means of carrying knapsacks, and other burthens upon or from the shoulders.

1762. Richard Albert Tilghman, of Philadelphia, United States of America, chemist. Improvements in the manufacture of alkalies and alkaline earths.

1766. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the purification of gas for illuminating purposes by separating therefrom the carbonic oxide, and in the application of such carbonic oxide to heating purposes. A communication from Mathieu Léon Pujol, of Paris, France, gentleman.

1768. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. A new material for ornamenting various articles. A communication from Charles Victor Beslay, of Paris, France, merchant.

Dated August 4, 1855.

1772. John Anderson, of Edinburgh, Mid-Lothian, clothier. Improvements in shirts.

Dated August 6, 1855.

1778. Henry Gilbee, of South-street, Finsbury. Certain improvements in constructing flat-bottomed boats. A communication from Monsieur Jacovenco, of Paris, France.

1780. John Platt, of Oldham, Lancaster, mechanical engineer, and John Hibbert, of Ashton-under-Lyne, manager. Improvements in mules for spinning and doubling, which improvements are also applicable to other machines in which clutch-boxes are used.

1782. John Lilley, of Birkenhead, Chester, merchant. Improvements in obtaining textile fibres, and in the manufacture of pulp and dye.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1798. Charles Frederic Thomas, of Massachusetts, United States of America. Certain new and useful improvements in boilers for steam-carriages. August 8, 1855.

1803. Alonzo Webster, of Vermont, United States of America. An improvement in machinery by which a horse may be suddenly disengaged from a carriage while running away with the same, or whenever required to be detached from it quickly. Partly a communication from Harvey Webster, of Vermont. August 9, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August 22nd,* 1855.)

780. Edward O'Callaghan. Improvements in ordnance and in projectiles applicable to ordnance and small arms.

788. John Henry Johnson. Improvements in machinery or apparatus for combing wool and other fibrous substances. A communication from Victor Brosser, of Beauvais, France.

789. John Henry Johnson. Improvements in machinery or apparatus for preparing cotton and other fibrous substances. A communication from Jean Beugger, of Wülflingen, Switzerland.

796. John Alderman. Improvements in the construction of adjustable couches, chairs, and other similar descriptions of furniture for invalids.

797. James Fletcher. Improvements in, and applicable to, machines for spinning and weaving cotton, wool, and other fibrous materials.

809. Alfred Thomas Richardson and George Mallinson. Improvements in the manufacture of certain piled fabrics.

810. Ferdinand Wilhelmy. Border-paddles for steamboat-wheels.

820. John Jarman. Improvements in horseshoes.

827. Jane Ann Herbert. Improvements in propellers for vessels, which are denominated the opical propellers. A communication from William D. Jones, of Pokeepsie, and Henry Whinfield, of New York.

839. Arthur Wellington Callen, Joseph West, and George Washington Lewis. Improvements in the construction and fittings of tents, especially suitable for military purposes.

901. Samuel Walsh and John Henry Brierley. A clasp or fastener for belts, bands, or straps.

924. Mark Mason. Improved machinery or apparatus for manufacturing metallic "sole-tips" and "heels" for clogs, boots, or other coverings for the feet.

938. Edward Frankland. Improvements in the treatment of certain salts, commonly called alums, to obtain products therefrom.

944. Peter Armand Lecomte de Fontainemoreau. Improvements in apparatus for preventing the escape of fluids, which he calls diaphragm obturator. A communication.

960. Frank James Wilson Packman. Improvements in projectiles, in projectile instruments, and in the means of charging the same.

985. Samuel William Campain. Improved machinery for filling corn and other sacks.

1022. James Lewis. An improved soap.

1078. William Dray. Improvements in the manufacture of frames for all kinds of structures, together with the means of fastening the same when necessary, part of which is applicable to the manufacture of screws and bolts.

1116. William Johnson. Improvements in the manufacture, treatment, and application of oily, resinous, and gummy substances and soaps. A communication.

1212. Edward George Swinton. Improvements in applying motive power for grinding corn, and for other similar purposes.

1295. Henry Nunn. Improvements in the construction of carriages for invalids and children, part of which improvements is also applicable to street cabs and other carriages.

1321. Joseph Robinson. Improvements in tables.

1337. William Armitage. Improvements in the manufacture of union-bags and sail-cloth.

1370. John Harvey Sadler. Improvements in looms for weaving.

1383. William Little. Improvements in printing machinery.

1527. Christian Freidrich Werner and Loudovicus Piglhein. An improved manufacture of elastic stuffing for chairs, couches, and other articles requiring the same.

1555. Charles Frederick Bielefeld. Improvements in the manufacture of saddle-trees.

1568. Edward Simons. A new or improved instrument or apparatus to be used for condensing and absorbing the smoke and products of combustion arising from gas and other flames, and increasing the illuminating power of the said flames.

1644. George Conner. An improvement in the manufacture of brushes.

1662. Henry William Ripley. Improvements in dressing and finishing woven fabrics composed wholly or partly of wool. Partly a communication.

1671. Louis Antoine Ritterbandt and Joseph Bower. An improvement in the manufacture of manure.

1673. Joseph Westwood and Robert Baillie. Improvements in preserving timber-built ships, also timber or wood and wrought iron, used in situations exposed to the action of water or of weather.

1683. Richard Polkinhorn Huthnance. Improvements in drying, and in apparatus to be used therein.

1752. Richard Albert Tilghman. Improvements in the manufacture of candles.

1798. Charles Frederic Thomas. Certain new and useful improvements in boilers for steam-carriages.

1803. Alonzo Webster. An improvement in machinery by which a horse may be suddenly disengaged from a carriage while running away with the same, or whenever required to be detached from it quickly. Partly a communication from Harvey Webster, of the State of Vermont.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed August 17, 1855.

357. James Wright.
364. George Redfield Chittenden.
366. George Tillett.
367. David Hulett.
376. Joshua Kidd.
386. Frederic Prince.
402. William Henry Zahn.
409. Barnaby Angelo Murray.
414. William Brown.
422. Thomas Nash, junior.
439. Charles Frederick Stansbury.
494. William Hyde.
785. Samuel Fielding.
819. Thomas Wimpenny, and Jonas Wimpenny.
1307. Richard Anstey Tucker.
1323. Samuel Colt.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
July 27	3740	J. S. C. Hill and C. Coe	Manchester	Camp Cloak.
Aug. 4	3741	J. Shaw	Brighton	Soap-cutting Machine.
8	3742	G. R. and J. Bengough	Tichborne-street	Portmanteau.
11	3743	Littlehales and Green	Birmingham	Tray Edges.
13	3744	E. Israel	Milk-street	Reel.
14	3745	C. F. Dennet and G. Pays	Notting-hill	Percussion Cap and Cartouche Pouch.
16	3746	S. B. Woolf	Old Bond-street	Trousers Alliance.
23	3747	E. Israel	Milk-street	Reel.
		PROVISIONAL REGISTRATIONS.		
July 27	683	S. Bullock	Battersea	Syphon Tap.
28	684	D. Wheatley	Barnsbury	Albert Boot.
30	685	J. Hunt	New Kent-road	Bill Head.
Aug. 10	686	Capt. Chiosso	Oxford-street	Polymachinon.
11	687	F. Wicksteed	Upper St. Martin's-lane	Carriage-spring Brace.

NOTICES TO CORRESPONDENTS.

E. A. Allen.—Your letter, which reached us too late for insertion in this number, shall appear in our next.

Naval Architect.—The *Hampshire Advertiser*, a paper always well informed on naval matters, says of them (the Floating Batteries, *Glutton* and *Meteor*), "They will neither sail, steam, stay, nor steer with satisfaction or dependence; and as quarters for a healthy ship's company, they are certain hotbeds for fever, sickness, or suffocation. Men employed in the magazines of these ships, after working a short time, have been hauled up senseless, the state of the atmosphere therein being shown by the fact that a candle-light has been extinguished by the overpowering foulness of the air; the generation of unwholesome gases, from bilge water and other noxious causes, is fearful; a tumbler of pure water placed between decks becomes, in a very short time, very perceptibly impregnated. The Dockyard chemist has been investigating these dangerous defects in these vessels, with a view to some remedy; but that remedy, we think, lies beyond *his* reach—ventilation is the only remedy that can do the crews any good, and this can only be obtained by the utter metamorphosis of the ships. They have no keels; and what is to prevent them from toppling over when they get their batteries on board, we cannot see."

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

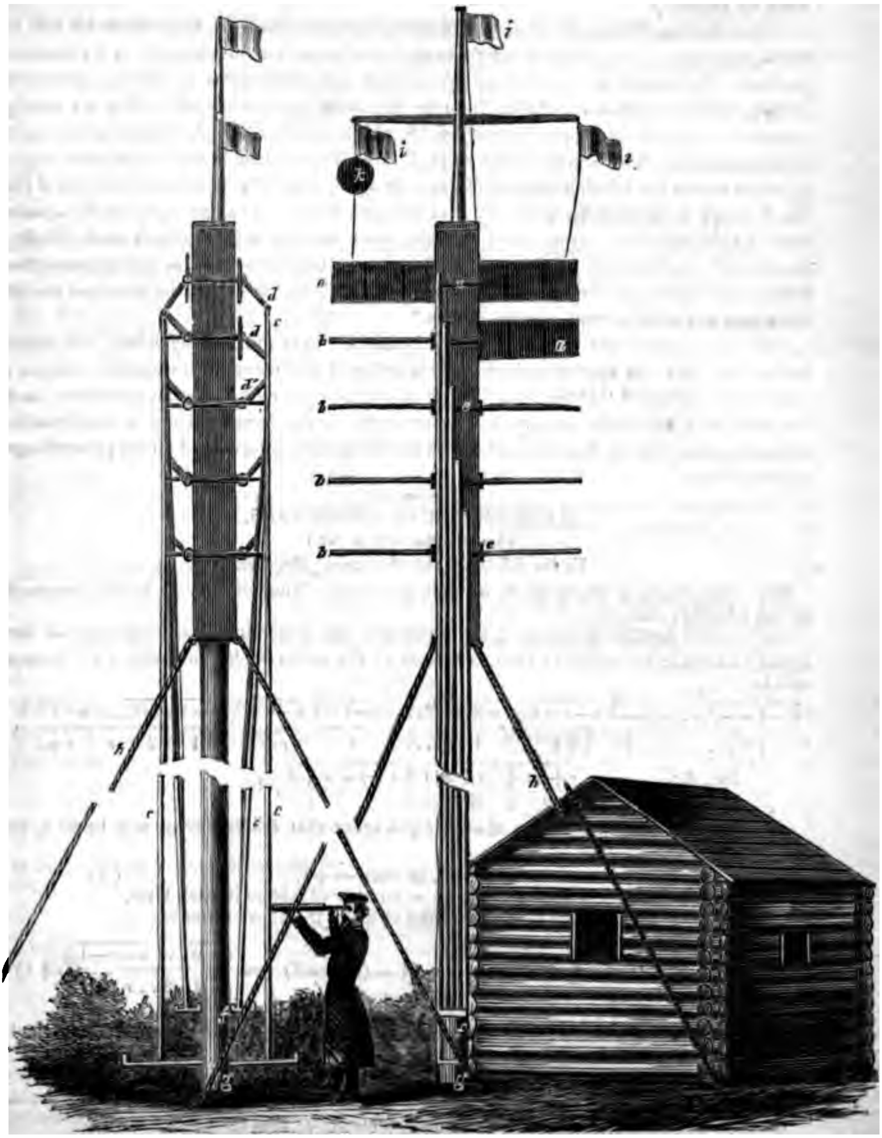
[redacted]

Mechanics' Magazine.

No. 1673.] SATURDAY, SEPTEMBER 1, 1855. [PRICE 3D

Edited by R. A. Brooman, 166, Fleet-street.

RUSSIAN TELEGRAPHS ON THE COASTS OF THE BALTIC.



RUSSIAN TELEGRAPHS ON THE COASTS OF THE BALTIC.

We this week present to our readers, on the preceding page, a view of one of the numerous Russian telegraph stations that encircle the whole of the Baltic and that part of the Gulf of Bothnia which is not Swedish territory. The particular one shown was situated on the northern shore of the Gulf of St. Petersburg, and, together with several others, was recently destroyed by the boats of the English fleet. The sketch and following description were forwarded to us by an officer of the Royal Navy, and may be relied upon for accuracy.

"The Russian Telegraph consists of a strong upright pine spar, from the under side of the square forming the head of which extend four guys, *h*, *h*, to secure it in its vertical position. On each of two sides of the square head extend five arms or vanes, *a*, *a*, formed of thin sheet-iron, which are thrown from the horizontal position (in which they are nearly invisible) to the vertical (as shown in fig. 1*, which is a front view), by moving the light pine battens, or poles, from the upper stage, *f*, and allowing them to rest on the lower stage, *g*, which causes the lever on the spindle, *e*, *e*, to move from the position indicated at *d* (in fig. 2, which is a side view), to that of *d* in the same figure. The upper part of the square head is surmounted by a cross, fitted at either arms, and also at its top, with small blocks, to either of which a small red flag is hoisted, or one or two black balls, as the nature of the information intended to be conveyed may require. It is supposed that the principal use of the upper flag is to indicate a pause or stop."

"To those conversant with telegraphic systems," says our correspondent, "it must be evident that the apparatus depicted is capable of producing most extensive changes; and we are informed that the rapidity with which they are worked by the attendants, and the ease with which the arrangement is apparent to the unassisted eye at considerable distances, show that the Russian authorities can be speedily informed of all the proceedings of our cruisers."

MATHEMATICAL EXERCISES.

(See ante No. 1671, p. 157.)

To the Editor of the Mechanics' Magazine.

Sir,—The Series given by A. R. in your last week's Number, may be readily summed in the following manner:

Let r be the number of factors in the numerator and denominator of each term of the series which is to be summed: then, the terms of the series each containing $\overline{r+1}$ factors will be

$$\frac{\overline{n-1}\,\overline{n-2}\ldots\ldots\overline{n-r}}{1\cdot 2\ldots\ldots\ldots r}\,\frac{\overline{n-r-1}}{\overline{r+1}},\quad \frac{\overline{n-2}\,\overline{n-3}\ldots\overline{n-r-1}}{1\cdot 2\ldots\ldots r}\,\frac{\overline{n-r-2}}{\overline{r+1}},\quad \frac{\overline{n-3}\,\overline{n-4}\ldots\overline{n-r-3}}{1\cdot 2\cdot r}\,\frac{}{\overline{r+1}},$$

$$\&c., \&c.\qquad \frac{\overline{r+4}\,\overline{r+3}\,\overline{r+2}}{1\cdot 2\cdot 3},\ \frac{\overline{r+3}\,\overline{r+2}}{1\cdot 2},\ \frac{\overline{r+2}}{1},\ 1.$$

If x be the number of terms in the series, in order that the last term may be $=1$, we must have

$$n-x=r+1, \text{ or } x=n-\overline{r+1}, \qquad \text{(A)}$$

or the number of terms in each series $= n$ − number of factors in each term.

The difference between the first and second terms of the above series =

$$\frac{\overline{n-2}\,\overline{n-3}\ldots\ldots\ldots\overline{n-r+1}}{1\cdot 2\ldots\ldots\ldots\ldots\ldots\ldots r}\,\frac{}{\overline{r+1}}\left\{n-1-(n-r-2)\right\}=\frac{\overline{n-2}\ldots\overline{n-r-1}}{1.2..r\,\overline{r+1}}(r+1)$$

$$=\frac{\overline{n-2}\,\overline{n-3}\ldots\ldots\overline{n-r-1}}{1\,.\,2\ldots\ldots\ r}$$ or the second term of the series of the same form, which has r factors in both numerator and denominator.

* The drawing is made with a break in it, not to occupy more space than necessary.

[redacted]

Also the difference between the second and third terms of the same series

$$=\frac{\overline{n-3}\,\overline{n-4}\,\ldots\ldots\ldots\,\overline{n-r-2}}{1\,.\,2\,\ldots\ldots\ldots\,r\,\overline{r+1}}\left\{n-2-(n-r-3)\right\}=\frac{\overline{n-3}\ldots\overline{n-r-2}}{1\,.\,2\ldots r\,\overline{r+1}}\left\{r+1\right\}$$

$$=\frac{\overline{n-3}\,\overline{n-4}\,\ldots\ldots\ldots\,\overline{n-r-2}}{1\quad 2\,\ldots\ldots\ldots\,r}$$

= third term of the series of the same form which has r factors in both numerator and denominator.

In the same way the difference between the xth and the $\overline{x+1}|th$ terms of the same series

$$=\frac{\overline{n-x}\,\overline{n-x-1}\,\ldots\ldots\ldots\ldots\,\overline{n-x-r}}{1\cdot 2\ldots\ldots\ldots\ldots\ldots r}-\frac{\overline{n-x-1}\,\ldots\ldots\ldots\ldots\,\overline{n-x-r-1}}{\overline{r+1}\ldots\ldots 1\cdot 2\ldots\ldots\ldots\ldots\ldots r+1}$$

$$=\frac{\overline{n-x-1}\,\overline{n-x-2}\ldots\ldots\ldots\overline{n-x-r}}{1\cdot 2\ldots\ldots\ldots\ldots r\,\overline{r+1}}\left\{n-x-(n-x-r-1)\right\}$$

$$=\frac{\overline{n-x-1}\cdot\overline{n-x-2}\ldots\ldots\ldots\overline{n-x-r}}{1\cdot 2\ldots\ldots\ldots\ldots\ldots r}$$

$=\overline{x+1}$th term of the series which has r factors in both numerator and denominator.

Representing then by a_{r+1}, b_{r+1}, c_{r+1}, &c. .. k_{r+1}, $l_{\overline{r+1}}$, and a_r, b_r, c_r, &c. ......k_r, l_r the first, second, third, &c.....and last terms of the series which has $\overline{r+1}$ and r factors in each term respectively, we have from the above,

$$a_{r+1}-b_{r+1}=b_r$$

$$b_{r+1}-c_{r+1}=c_r$$

$$c_{r+1}-d_{r+1}=d_r$$

$$\&c. - \&c. = \&c.$$

$k_{r+1}-l_{r+1}=k_r$ [since there is one term more in the second series than in the first—from

$l_{r+1}-0=l_r$ (A.)]

adding both sides of these equations

$$a_{r+1}=b_r+c_r+d_r+\ldots\ldots k_r+l_r$$

$=S_r-a_r$, if S_r represent the sum of the series which has r factors.

$$\therefore\ S_r=a_r+a_{r+1}$$

or the sum of the series of the given form which has r factors in each term is equal to the first term of that series, together with the first term of the series which has $\overline{r+1}$ factors in each term.

Let $r=1$

Then $S_1=n-1+\dfrac{\overline{n-1}\,\overline{n-2}}{2}=\dfrac{n}{2}\,\overline{n-1}$

as we well know from Arithmetical Progression.

Let $r=2$

$$S_2=\frac{\overline{n-1}\,\overline{n-2}}{1\cdot 2}+\frac{\overline{n-1}\,\overline{n-2}\,\overline{n-3}}{1\cdot 2\cdot 3}$$

Let r be general,

$$S_r=\frac{\overline{n-1}\,\overline{n-2}\ldots\ldots\ldots\overline{n-r}}{1\cdot 2\ldots\ldots\ r}+\frac{\overline{n-1}\,\overline{n-2}\ldots\ldots\ldots\overline{n-r-1}}{1\cdot 2\ldots\ldots\ldots\ \overline{r+1}}$$

To any one wishing to become acquainted with the properties of series, and possessing only a knowledge of elementary algebra, I cannot too strongly recommend "Young's Algebra," in which he will find a general method by which any series may be readily summed.

I am, Sir, yours, &c.,

August 20. ARTIFICER.

JACKSON'S MACHINE FOR MOULDING COG AND OTHER WHEELS.

After reading the paper descriptive of the above machine, which was published in our last number, Mr. Jackson exhibited a series of specimens of patterns for spur and bevel wheels made by the machine, from 3-8 inch to 4½ inches pitch, and extending to 16 inches in breadth, with the steel cutter used for forming the teeth of one of the patterns, and the tin templet from which the cutter was shaped; also a cast wheel 2 feet 3 inches diameter that had been moulded on the machine. He explained that after having moulded the teeth of a wheel, the further completion of the mould by inserting the cores for the centre and arms could either be done on the machine or after the box was removed, as might be most convenient; sometimes the wheel had been cast whilst the box remained on the machine, but generally the box was removed as soon as the teeth were moulded, to allow another wheel to be proceeded with; and four or five wheels were sometimes on the floor at once, ready for casting at night, all moulded by the one machine during the day. The core-box for the arms was simple in construction, being made with two sides only, fixed at the required angle, determined by the number of arms, and having an adjustable end and bottom, to suit the different diameters and breadths of wheels.

The Chairman (Mr. W. Fairbairn, F.R.S.) said he had seen the machine at Mr. Jackson's works, and was much struck with the great accuracy with which the moulding of the teeth was accomplished, the motion of the slide being quite parallel and steady, so that the pattern was drawn out without risk of disturbing the sand. Before seeing the machine he feared some practical difficulty in insuring accuracy of the pitch at the several joinings of the pattern; but this was completely provided for, by the whole movement of the table, both in moulding and in cutting the pattern, being given by the same dividing wheel, which could be constructed with any required degree of accuracy. The machine appeared an excellent mechanical arrangement for obtaining a degree of accuracy in the sand, superior to the ordinary process of moulding; and he thought the work must be truer than in any wheels cast from a pattern built up of pieces. He inquired what was the velocity of the cutter employed in forming the segment pattern, and whether the cutter finished the pattern sufficiently smooth for use?

Mr. Jackson replied that the cutter was driven at about 1,000 revolutions per minute, and the teeth of the pattern were completed at once by the cutter, and not touched by hand, except what was requisite for varnishing the pattern, which was done to protect it from injury by moisture. The cutter was driven by a cord, stretched tight by a sliding pulley and weight, to allow for the different positions upon the table required for cutting patterns of different diameters.

The Chairman inquired how the cutting of bevel wheel patterns was managed on the machine?

Mr. Jackson explained that a cutter shaped for the small end of the teeth was used in the same manner as in cutting the patterns for spur wheels, except that the pattern-block was held stationary, and the sliding motion given to the cutter in a direction corresponding to the inclination of the cone of the intended wheel, by an adjustable slide. The same slide could also be adjusted to carry a second cutter, revolving at right angles to the main cutter, which would finish the ends of the teeth, by cutting them off at proper angles to the face, and at the required length, the cutter-frame being made to travel round with the circular table. The teeth of the pattern were thus pitched out accurately by the machine, and finished at the small ends; and the spaces removed by the cutter were then widened and deepened to a uniform taper towards the other or large ends of the teeth, these large ends being first accurately marked out by placing instead of the first steel cutter a tin templet accurately fitting into its place, and shaped to the correct form for the large ends of the teeth; this templet was then brought down upon each space of the segment pattern in succession, by means of the dividing wheel, and the exact pitch and outline of each tooth carefully scribed from the templet.

Mr. Hodgkin asked whether the teeth of the pattern were dressed by hand to the required taper?

Mr. Jackson said that some part of the work of shaping the teeth in bevel patterns only was done by hand; but the accuracy of the pattern was not affected, as the man had only to dress them off to a straight edge between two given points, since the teeth were accurately pitched and cut complete at the smaller end by the machine, and the position of the templet employed for marking out the larger end of each tooth must in each case truly coincide with the previous position of the cutter in forming the small end of the tooth, on account of the same movement of the dividing wheel of the machine being employed for the purpose in both cases.

The Chairman suggested the adoption of some different arrangement of cutter, to enable the tapered teeth to be entirely shaped by the machine, as it was advisable

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to avoid, if possible, any dependence upon hand work in forming the pattern.

Mr. Ramsbottom observed that the curve of the tooth in a bevel wheel being different at every portion of its length, on account of the whole tooth being tapered both in breadth and depth, caused the difficulty in cutting it by machinery, as no cutter could be passed through in the ordinary way, except the one fitting the small end of the tooth.

Mr. Jackson said that an ingenious arrangement had been made by Mr. Bodmer, to shape the teeth in bevel wheels by means of a long conical cutter revolving on an axis parallel to the teeth instead of at right angles to them, and pointing always truly to the apex of the cone of the wheel, the outer end being guided to the required shape of tooth by an enlarged templet. Such a cutter might give a pretty correct form to the teeth throughout their length, if the true taper of the sides of the cutter to the centre of the cone could be always maintained; but in his opinion there were great practical difficulties in its application.

Mr. Fernie inquired the expense of moulding by the machine, as compared with the ordinary mode of moulding cog wheels, when there was a pattern already made?

Mr. Jackson replied there would be little difference; his bevel wheels moulded by the machine were about the ordinary price, and spur wheels rather under; spur wheels were supplied by him then at about 13s., and bevel wheels at about 17s. per cwt. In using the machine it was unimportant whether the pattern had to be made or not, as the cost of a segment pattern was very small; the smaller sizes were produced for about 3s. 6d. each, including the cutter.

Mr. Fernie inquired what plan was followed in determining the form of curve for the teeth. He thought the machine appeared one of so much importance, and gave such facility for the correct formation of the pattern, that the advantage of the best theoretical form of tooth might be obtained in all the wheels, without regard to existing patterns.

Mr. Jackson said he made any form of tooth that might be desired, and often had to form a special shape in the case of making a wheel to replace an old one, the teeth of the new wheel being modified so as to accommodate it in the best manner that was practicable to the actual form of teeth of the fellow wheel with which it had to gear.

The Chairman suggested that the form of teeth recommended by Professor Willis, and so completely worked out by him, might be advantageously adopted, and the machine certainly gave an important superiority in enabling wheels to be cast with the form of teeth best adapted to the particular purpose for which each wheel was required, without being confined by the limits of ordinary patterns.

Mr. Jackson said the plan he adopted for the form of teeth, when left to himself, was one suggested to him by Mr. Bodmer, which was to employ true epicycloid teeth, by cutting wood templets to the curves of the particular circles in each case, and rolling them upon one another, tracing the true curve by a steel point attached to the one circle upon a tin templet fixed upon the other; the true curve for a single tooth was thus obtained without hand work, or the usual approximation by arcs of circles, and the steel cutter was then accurately fitted to the outline traced on the tin templet, this being, in fact, the only hand work in the whole process; the subsequent action of the machine insured a perfect copy of the form of the cutter in every tooth.

Mr. Hawkes thought the machine was very ingeniously contrived, and would certainly produce very accurate work: he wished to know whether the time required for moulding the wheels was any longer than by the ordinary process.

Mr. Jackson replied that the time of moulding was about the same in the case of small wheels; the teeth of a 3 feet wheel, either spur or bevel, would be moulded in about three hours by the machine. In the case of large wheels, the moulding might be done quicker with an entire pattern than by the machine, by several sets of men being employed at once round the wheel; but in the use of the machine, an important saving of time was found in practice from the circumstance that the necessity for mending the mould was avoided, which often caused considerable delay in the ordinary moulding, and however skilfully performed, the repaired part could never be so satisfactory as the rest of the mould.

Mr. Hawes asked whether in the case of a large number of wheels, say 100, being ordered from the same pattern, it would be considered preferable to make an entire pattern, or still to mould them with a small segment? and suggested for such cases the applicability of a modification of the machine, adapted to draw the whole pattern at once, in a similar manner to the plan adopted with the segment pattern.

Mr. Jackson said such a case had not occurred at present, as the machine had been mostly employed for making single wheels; but in such a case, a larger segment of the pattern might probably be employed, or even an entire pattern, if the wheel were of moderate size. A machine might doubtless be made to lift any sized pattern, but there would be great difficulties in carrying it out practically, and with the present machine

the process of moulding the teeth was so simple and certain that it was effected with great rapidity; the moulding could be done with a segment of a single tooth with equal accuracy, but time would be lost, and the general practice was to have from three to seven teeth in the pattern.

The Chairman inquired what time the machine had been in operation since first starting, and how much work it had done?

Mr. Jackson said it had been in work for eight or nine months, and about 170 spur and bevel wheels had been moulded upon it; the machine was now in constant work, and two improved machines, similar to the drawings exhibited, were also being made, to work in his foundry.

Mr. Hawkes inquired whether any of the wheels moulded by the machine had been put to work in the neighbourhood of Birmingham?

Mr. Jackson was not aware whether any had been used in that district; most of the wheels had been made for millwrights and others, who were not able to get wheels to replace broken ones; from not being able to find suitable patterns, they had then sent for wheels moulded by the machine, to prevent the serious delay involved in making a new pattern; the saving of time was found very important in the case of the breakage of large wheels in mills, as they were enabled to replace the wheel and start the mill again in two or three days, instead of sometimes having a delay of nearly as many weeks.

The Chairman inquired what increase of speed was anticipated by Mr. Jackson, as practicable in heavy gearing, in consequence of the superior accuracy in the teeth of the wheels moulded by the machine?

Mr. Jackson thought it was very difficult to assign a limit to the speed, if the teeth of the wheels were really accurate; he thought a velocity of 5,000 feet per minute might be attained in the circumference of heavy wheels, with the improved teeth obtained by the machine. He had found very considerable increase of speed practicable in many cases where new wheels moulded by the machine were substituted for old ones that had broken. In a rolling mill he was acquainted with, some of the old wheels had about $\frac{3}{8}$ths inch clearance, and badly-shaped teeth, and when he had put some new wheels moulded by the machine into their place, a great difference in the smoothness of the motion was experienced. He was confident the great imperfection in the teeth caused in some cases an irregularity to be communicated to the motion, and a serious loss of power in heavy machinery; and a much higher speed might be safely *attained by proper construction* of the teeth than was generally considered practicable. He had been much struck by seeing in a spinning mill, at Alsace, in France, the whole of the self-acting-mule spindles, which were running at 4,000 revolutions per minute, driven by cog wheels in place of bands; there was of course a shrill sound in the rooms from so many thousand wheels, but there was no excessive noise, such as to prevent the voice being heard. He was convinced by the examination of that machinery, that accuracy of construction in the teeth was alone wanted to render practicable with cog wheels any speed likely to be required in machinery. These wheels were of iron, cast from metal patterns very carefully made.

After some further conversation respecting the withdrawal of the pattern from the mould, and the kind of sand used for moulding,

The Chairman said the machine appeared to be a very ingenious and successful improvement in the process of moulding cog-wheels, and of great practical importance; he proposed a vote of thanks to Mr. Jackson for his communication, which was passed.

ON THE VENTILATION OF BUILDINGS.

BY J. FORBES WATSON, M.A., M.D., BOMBAY ARMY.*

The indications to be fulfilled, by as perfect a system of ventilation as it is practically possible to have, I conceive to be the following:—In the first place, the air should be purified; and it ought to be of the proper temperature, and neither too dry nor too moist: and in the second, it must be delivered into a given building, and diffused or circulated so that the individuals within shall be constantly, but insensibly, receiving supplies of fresh air in requisite quantity, and that this should be effected in such a manner as to avoid draughts, and prevent also, as far as possible, the entrance of the unpurified, or malarious air, from without. The first of these conditions can, I believe, be ensured by the means already detailed, and it now only remains to treat of the second.

I shall assume that the fan, or supplying agent adopted, is capable of furnishing the required volume of air, and at once pass on to the question of its diffusion. In order to effect this, I have adopted the following

* The above article forms part of an excellent and important paper recently laid before the Society of Arts by the author, who has been associated with Dr. Stenhouse in investigations respecting the purification of air and the supply of it to buildings, &c.

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arrangement. The air, after passing through the filter, &c., is conducted, by means of a large tube, into the adjoining apartment, at the height of about eight feet from the floor. This tube, immediately on entering the chamber, bifurcates or divides into two branches, which pass round the room at the same level, and ultimately unite at the opposite side, thus forming, as it were, a loop composed of tubing. This tube, or "air-diffuser," may be of very simple materials. In the present experiment it is constructed of light zinc, and attached to the wall in a temporary manner by means of a few nails. It is of a square form, four inches in depth from before backwards, and six inches in breadth in the vertical direction. The front of the tube is composed of a tolerably close-textured canvas, and it presents an air-delivering surface of 35 square feet, the length of the tubing being 70 feet. Immediately at the entrance-point for the air, and extending for a little way, the front of the tube is completed by means of metal—not canvas—in order to ensure more completely the division of the current, and to prevent an unequal or extra amount being delivered at this part. The result of the whole of the arrangement is, that the air, on being forced by means of the fan into this delivering tube, is caused to pass from all sides through the pores or meshes of the canvas, and it thus becomes constantly and insensibly diffused in every direction throughout the room. In this manner—returning to a former illustration—we get our large entering current of air broken into almost an infinity of jets, which are constantly being passed from *all sides* into the apartment; and not only so, but also being made to enter at *varying angles*, so as to insure, as formerly explained, the establishment of a series of revolving currents, which, in their progress, shall pass into every corner, and leave no part unventilated. The angles at which these minute jets or currents pass through the canvas, can be readily demonstrated by means of down or light feathers, or by the flame of a taper; but for the sake of convenience, and in order to avoid accident, in the experiments actually made, the former method was adopted. In the first place, the fact that the air during the action of the fan did pass through at every part of the canvas was ascertained, and the direction of the currents then established. The angles at which these entered the apartment were found to vary at different parts, that of the side ones being, as might have been expected, by far the most acute; in fact, the only part where a *direct* current existed at all, was found to be on the side opposite to the main entrance. Of course, if the canvas were very close in texture, and the *amount of air urged insufficient* to cause some pressure within the tube, the result would be that these currents would pass more directly from the sides and for a greater distance towards the centre of the room; but the effect produced would ultimately come to be the same. With regard to the amount of air delivered from the different sides under ordinary circumstances, or those in which the air is not made to pass through under particular pressure, as was to be anticipated, the largest quantity passes through the canvas towards and at the point where the two currents meet, opposite the main entrance, and the least at the sides; and this leads to the practical suggestion of having the canvas at the latter parts, viz., the sides, of a coarser description than at the others, as by this means the amount of air delivered from all quarters will become equalized. This indicates also another advantage, which the canvas more readily affords than any other material, such as perforated zinc, &c., viz., that when in a given chamber more or less air, from its shape or other circumstances, is required at one part than at another, this can, in the same manner, be readily delivered by using a wider-meshed canvas at those parts, and *vice versâ*. In the same way, also, the adoption of the canvas secures another convenience, as it prevents the necessity, within certain limits, for increasing the size of the tube or air-diffuser; for one, even, of very moderate size, by employing very coarse canvas, can be made to deliver almost any amount of air; and, on the other hand, if a small amount only be required, canvas of finer texture can be used, and so on; and in addition to these advantages, the cheapness of this material is, of course, a recommendation.

With regard to the position of the "air-diffuser" above the floor: this must also, to some extent, be adapted according to circumstances, such as the height and breadth of the chamber, &c. In some special cases, even more than one tube may be required; and, of course, in all public buildings with galleries, a separate diffuser, coming off from the main one, will have to be adapted for the ventilation of these. As a rule, I am inclined to think that ordinarily six to eight feet from the floor, or from two to four above the heads of the sitters, will prove in the great majority of cases about the proper distance, and the same height will probably answer for hospitals, although the relative distance between the entrance of the air and the individuals will be somewhat increased from the recumbent position in the case of the patients. The rule, in the first place, is to avoid the *direct* current of the air; and this at once establishes the position of the diffuser above the heads of the occupants; and in the second, at the same time, to have

the tube so placed as to secure, consistently with safety, full effect from the circulation of the air which is constantly going on. I have already shown that the air in an apartment with an arrangement of the above description *must* be in constant movement, and the object is to hit as near as practicable to that point when its action becomes insensible, and, at the same time, full benefit from its diffusion at the proper level secured. If care be taken not to place the "diffuser" *too low*, the height then comes to be of less importance; as, from the absence of special openings of any size above, the general movement of the air, as was formerly explained, must be downwards; as the exit points are all below, and as it is presumed to be passing in in considerable quantities, it has no resource but to seek a way out through these.

There are some people who would prefer, as far as their feelings are concerned, to remain almost constantly in a "draught;" but, in considering various sanitary arrangements, reference can only be had to such as will secure the greatest amount of benefit to the majority, and certainly under our climate in this country such instances as the above are comparatively rare.

From what has been said, it will be evident also that the distance of the "diffuser" above the heads of the occupants will have to be regulated according to the amount of force employed; for if a large volume of air be driven into an apartment with considerable force, it is clear that the tube will require to be placed considerably higher up than it would under more moderate circumstances. It is impossible, therefore, to lay down the exact position of the "air diffuser." All that can here be done is to indicate a few of the elements involved in the calculation.

Utility is, in all cases, a main consideration; and although it is often difficult to combine the "useful with the ornamental," care ought at least to be taken to avoid causing a disfigurement; and as these "diffusers," as attached in the present experiment, have perhaps somewhat that effect, I should recommend that, in practice, they be embedded in the walls, at the proper height; and this could be readily done, especially during the construction of new buildings; and in such cases the necessity for even a tube of metal, or other material, could be obviated by simply leaving a plastered cavity, of the requisite size, all round, with edges of wood disposed for the convenient attachment of the canvas, which, when an object, could be dyed of various colours, such as red, green, &c. Other steps could, of course, likewise be taken to render such arrangements actually ornamental; and this is by no means an unimportant consideration, for health itself is not unfrequently sacrificed when this cannot be secured.

I may here mention that, although of course the plan here proposed may be applied anywhere, it is for the public buildings, or those in which a number of persons are collected, that it is chiefly applicable; for, as I have already attempted to show, *by no other system is it practically possible* to secure, in such cases, even an approach to thorough ventilation.*

CROOKE AND LANCASTER'S LOOM PATENT: LAW CASE.

LIVERPOOL: CIVIL COURT, AUGUST 23, 1855.

Before Mr. Justice Crowder.

CROOKE AND ANOTHER *v.* RYLANDS.

Mr. Attorney-General Knowles, Mr. Hindmarsh, and Mr. Millward appeared for the plaintiffs, and Mr. Edward James, Q.C., and Mr. Webster for the defendant.

The Attorney-General, in opening the case, stated that the plaintiffs, Messrs. Wil-

* With regard to the warming of the air for winter use, in this and other climates, Dr. Watson makes the following observations:—"The method of heating it by means of steam or hot-water pipes is an excellent one, but the process could often be more cheaply and readily carried out by passing the air through wrought-iron tubes, arranged, for the sake of economising the heat of the fuel, in a manner somewhat similar to those in tubular boilers, &c. The barriers hitherto opposed to the warming of the air by the direct action of heated iron, as in this way, and in the case of stoves, arise chiefly from the disagreeable empyreumatic odours produced, and which are supposed to result from the partial charring of the organic impurities usually present in the air, and perhaps also, in the case of overheated cast-iron, from the giving out of minute quantities of sulphur, and, it may be, of phosphorus combined with hydrogen. These produce head-ache, accompanied with a disagreeable dry sensation, which is corrected, in some measure, by allowing a little water to evaporate within the apartment so heated; and perhaps in all cases the admixture of a small amount of vapour with the air, when artificially heated, will be found of use, as it seems to 'temper' it in some way, which has not yet been very well explained. Supposing, then, that the disagreeable effects produced on the system when air is heated in this manner do arise from previously-existing impurities, it is quite clear that if these were removed during the passage of the air through the filter, none such will be experienced; and in employing it for this purpose, I should feel inclined to recommend that the air be first heated, and afterwards *drawn*, by means of the fan, through the charcoal filter. In this case a small amount of moisture, if still required, could very readily be introduced, by having a portion of the delivering tube, shortly after leaving the fan, expanded and arranged with a small funnel and stop-cock, so as to present a flattened cavity for water, over the surface of which the heated air would have to pass. The great advantage of first heating the air is, that it enables the apparatus adopted for that purpose to be placed so as more readily to avoid accidents."

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liam Crooke and John Cochran, had brought this action to recover compensation from the defendant, an extensive cotton-spinner, for the infringement of a patent right in a certain invention in weaving-looms. The plaintiff, Mr. Crooke, who was the original discoverer of the invention, was a working handloom weaver, who, as long ago as 1844, had directed his particular attention to the improvement of the weaving apparatus; and while confined to his house with a long illness, which at that time prevented him from doing any work, he had a handloom brought to the house, and devoted considerable time and attention to it. Ultimately, after consulting with a person of the name of Lancaster, in the same occupation as himself, he succeeded, as he thought, in remedying several defects, and then he and Lancaster communicated with a gentleman who was probably well known to the jury, Mr. William Eccles, the late member for Blackburn, who watched their progress from time to time, and assisted them, as he was well qualified to do, with valuable practical suggestions which presented themselves to his own mind. In the result, a patent was taken out on the 18th September, 1845, and a specification was filed in the following year, in which part of the invention was stated to consist in the use of an improved check-strap, for preventing the rebound of the shuttle; and it was this part of the patent which the defendant, an extensive cotton manufacturer, would be shown to have extensively infringed. After the patent had been taken out, Lancaster assigned his interest in it to Mr. Eccles, and Mr. Eccles assigned, in his turn, to Crooke and his co-plaintiff Cochran, who, having twice brought actions in the County Court for the purpose of establishing their right, and succeeded on each occasion, were now driven to take the present proceedings, in order to compel the defendant to make them that compensation for the use of their invention to which they were justly entitled. The defence, as he understood, which was intended to be set up, was that the invention was not a new one, and he believed his learned friend would attempt to show that it had been used before the plaintiff's patent had been taken out. He felt assured that that attempt would utterly fail, and in that anticipation, knowing also that the case would necessarily occupy a considerable portion of their time, and that he should have an opportunity of addressing them again, he would proceed at once to call the witnesses who would establish the plaintiff's case. The learned counsel having first explained to the jury the improvements in the power-loom, from a model before him, called the plaintiff, who, however, upon cross-examination by Mr. James, acknowledged that certain inventions claimed by the fourth and fifth points of the specification were neither his, nor introduced with his authority; and that Lancaster had told him that a person named Bullough, who had discovered them, wished to have them introduced into their patent.

Lancaster was then called on the part of the plaintiff, but he also stated that the two improvements in question had been invented by Bullough.

Upon this the learned Judge said, that if there had been no disclaimer upon these two points, the plaintiffs' case was, in his opinion, at an end. It might do very well at a future day, with a disclaimer regularly entered.

The plaintiffs were then nonsuited.

DISCOVERY OF CARBONATE OF IRON.

It was stated a few days since, by Sir Walter C. Trevelyan, at a meeting of the Somerset Archæological Society, of which he is President, that a discovery had been made in the Brendon-hills, Somerset, of a vast quantity of carbonate of iron. This metal has heretofore been obtained chiefly from Silesia, and is used for the manufacture of steel. The size of the vein in these hills is said to far exceed that in the continental mines, and the discovery promises to be of great value, the amount annually expended in the purchase of this description of iron being about three-quarters of a million sterling.

Examples of Building Construction, intended as an Aide-Memoire for the Professional Man and the Operative: being a Series of Working Drawings to a large scale, exemplifying the Arrangements and Details adopted in carrying out the several Branches of Trade requisite for Public and Private Edifices. By Henry Laxton, of "the Civil Engineer and Architects' Journal," Author of "Laxton's Builders' Price-Book," &c., &c. London: Henry Laxton, 19, Arundel-street, Strand. (August.)

This is the first part of a work to be issued monthly, its object being to suppy the architect, the builder, and the operative with a choice collection of working drawings upon a large scale. The plates in this part are very well executed, and we do not doubt that Mr. Laxton will be found to exercise the necessary judgment in the selection of subjects for illustration. There are four plates in this part, the first representing

a casement window and boxing shutters, as executed by Messrs. Cubitt and Co.; the second, the entrance lobby of the Reform Club-house, with outer and inner doors and fittings, by Sir Charles Barry; the third, the roof of Exeter-hall, by S. Beazley, and the roof of Whitehall Chapel, by Inigo Jones; and the fourth, the clock-turret of Walton House, by Sir Charles Barry. Each plate is on a sheet 1 foot 9 inches by 2 feet 2 inches. The work is well conceived, promises to be ably executed, and will doubtless be held indispensable by all professional, and by many practical builders.

ON WORKING STEAM EXPANSIVELY IN MARINE ENGINES.

To the Editor of the Mechanics' Magazine.

Sir,—Some observations contained in a letter which appeared in your last number induce me to trouble you with a reply.

First, your correspondent errs when he says my paper contains tables "showing the advantages to be derived from working steam expansively, in the reduced consumption of coal, the reduced size and cost of engines, &c." The engines are supposed to be *increased* in size and cost, and the advantages of working expansively is shown, notwithstanding this.

Next he says that my method for doing this is nothing more or less than a modification of Sims's combined engine.

Figs. 1 and 2 show the elevation and plan of an engine having no resemblance to Mr. Sims's arrangement. Figs. 3 and 4 are modifications of Sims's engine, and were suggested as available plans when the size of the trunks became very large, which might be objectionable. Fig. 4, however, cannot be considered to have any additional friction over an ordinary engine, as both cylinders are double-acting, and the friction, therefore, only equivalent to the power.

I fully recognize the advantage of high-pressure steam in order to obtain economy, but in the paper which you have inserted I confined myself to the consideration of the subject of expansion when steam of the ordinary pressure was employed, say 20 lbs. above the atmosphere. In a paper I read at the last meeting in July, at Birmingham, I extended the inquiry, showing the still further economy which would result from employing steam of higher pressures.

Lastly, your correspondent seems to consider that the greater duty of Cornish engines arises solely from greater extension of heating surface; but this is not the case, *for a much greater difference in the duty is caused by the different modes of using the steam when obtained; or, in other words, by a greater degree of expansion in the Cornish engines.*

I am glad your correspondent agrees with me in believing that the duty of marine engines is capable of being increased (according to him, nearly 37 per cent.); but we differ as to the means.

Granting that great economy must arise from using steam in marine engines more expansively than is at present the practice, the question is, how it can best be done?

I should be glad to know your correspondent's mode of arranging an engine, which —with a given length of stroke and given length of connecting-rod, and also with a given pressure of steam and degree of expansion—would occupy less space and be more uniform in its action than my plan, which he seems to consider so defective.

The higher the pressure of steam and the greater degree of expansion employed, the greater appears the necessity of modifying the present forms of marine engines. A large cylinder worked with high pressure steam, which must be cut off at from 1-10th to 1-20th of the stroke, would be found very difficult to employ, especially where the stroke is short, as in screw engines. The strength of all the parts must also be sufficient to bear the first pressure of the steam on the large piston, and the ratio of the first to the last pressure would be very great. Without allowance for condensation, steam of 45 lbs. total pressure expanded nine times, would give a ratio of 21 to 1, allowing 3 lbs. as back pressure; whereas in my engine, the ratios would be only 3½ to 1 in the first step of expansion, and 6 to 1 in the second (the area of trunk being 2-3rds of cylinder), the mean being 4¾ to 1 only, and this for the same pressure of steam and same degree of expansion.

Apologising for the length of this letter,

I am, Sir, yours, &c.,

Edward E. Allen.

August 23, 1855.

P.S.—I must apologise for again trespassing upon your space; but the letter of your correspondent, Mr. Mushet, calls for some reply. I would only say, that the more expansive use of steam in marine engines would not at all necessitate the introduction of "the cumbrous expansive engine of Cornwall." Nothing more is wanted in order to obtain economy than an increase in the capacity of cylinders; and this may be, and in fact has been, carried out with engines of the ordinary construction; for when marine engines are using expansion gear, the thing is done, the size of the engines being then larger for the power developed.

The arrangements proposed by me are

designed to obtain economy of space and weight, and not with a view of obtaining greater economy in consumption of fuel than would be obtained by an ordinary engine working to the same degree of expansion. Economy of space and weight are, however, of vital importance. Mr. Mushet argues rather loosely when he concludes that I write in the interest of the Eastern Steam Navigation Company, merely because I have considered their vessel as representing a class. I only included this vessel because the coals proposed to be carried are for the out and home voyage. I have written quite as much in the interest of all the other classes. I would propose to Mr Mushet the same problem as to Mr. Truran, viz., to arrange an engine of the same power as mine, in the same space, and working with steam of the same pressure, and with the same degree of expansion; the expansion being carried down to say 4½ or 5 lbs. per inch, that is, 10 lbs. below the atmosphere. The length of the connecting-rod must also be considered.

E. E. A.

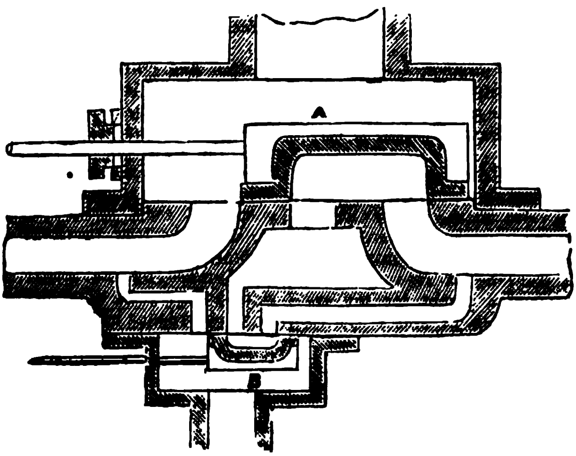
STEAM ENGINE VALVES.

To the Editor of the Mechanics' Magazine.

Sir,—Perhaps there is no question among engineers upon which a greater diversity of opinion exists, than that of the relative advantages of the different forms of valves used in steam engines. There are several kinds employed, among which may be enumerated Murdoch's valve, generally used in low pressure engines, the packing valve, extensively used in marine engines, the piston valve, the mitre valve, commonly employed in land engines of a large size, and last, though not least, the slide valve. There are also several varieties of the slide valve; but we will now confine ourselves to the ordinary one. Of late years this valve seems to be coming very much into use in a certain class of engines; but an idea seems to exist among engineers that it is not applicable to engines of a large size, where it is often required to stop or reverse the engine. We will now endeavour to prove that the slide is applicable to engines of every description, the Cornish pumping engine excepted. The advantages of the slide valve are, firstly, the extreme simplicity of the valve nozzle and gearing, the nozzle and cylinders being in most cases cast in one piece, and consequently reducing the number of joints about the cylinder; secondly, the little skill required for fixing it; and, lastly, its little cost. This last advantage can be best illustrated by giving the costs of a forty-five inch cylinder with the different kinds of valves and gearing, which will be as follows:

			£
With Murdoch's	valves	and gearing	478
„ mitre	„	„	486
„ piston	„	„	415
„ packing	„	„	398
„ slide	„	„	292

The disadvantages of the slide valve are, first, the wearing of the facing of the nozzle, which may be remedied in a great degree, by taking care when the cylinder and nozzle are cast that iron of a good quality be used, or by having the facing in a separate piece from the nozzle, so that it may be taken out and refaced in a very



short space of time; secondly, the difficulty, when the valve is a large one, of

moving it by hand, owing to the pressure of the steam upon its surface—and, although several patents have been taken out for methods of lightening the valve, they are all found, in practice, to be more or less objectionable. We will now submit to the consideration of your readers a plan for obviating this difficulty, which is, to use two valves, one being much smaller than the other, for the purpose of working the engine by hand. The idea will be best understood from the engraving on page 203, which is a section of a nozzle with two valves; the larger one, A, which has the requisite motion transmitted to it by means of eccentric gear, is for the purpose of admitting steam to and from the cylinder, when in the ordinary course of working; the smaller one, B, which is moved by means of a handle, is for the purpose of starting the engine. The action of these valves is easily understood. Suppose it is required to start the engine; in order to do this, the steam should be cut off from the large and admitted to the small valve; the small one should then be moved by hand so as to admit the steam to the piston and move it a stroke or two; while the piston is moving, the large valve should be thrown in gear with the engine and the steam shut off from the small and admitted to the large valve. Thus it will be seen the engineer is enabled to move the engine any part of the stroke, or indeed work it altogether, by means of the small valve, there being little weight upon it owing to the smallness of its area. When we consider what complicated gearing we have to some of our engines—and we refer to marine engines more particularly—for enabling the engine to start the engine, the advantages of such a simple contrivance will at once be seen.

I am Sir, yours, &c.,
JOHN TRURAN.

August 22, 1855.

P.S.—In your last number, I observe a letter from Mr. Mushet, in which he makes a slight mistake, for he confounds my name with that of Mr. William Truran, a very different person.

[The suggestion of our ingenious correspondent respecting the employment of a large and small valve, in the manner above described, for the purpose of starting or working the engine, has been anticipated by Mr. T. W. Bunning, of Newcastle-on-Tyne, who obtained a patent for the arrangement, on the 30th of March last.—ED. M. M.]

THE PROJECTILE CONTROVERSY.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Wilkinson states, in the last number of the Magazine, that your correspondents have been confounding two very distinct things; viz., "The Parabolic Theory of Projectiles," and "The Practice of Gunnery, * * * *, the resistance of the air being neglected in one, and brought into account in the other."

On reference to Sir John Herschel's Astronomy, Mr. Wilkinson will find that the question is clearly illustrated in connection with the actual condition of things, and in accordance with the original meaning of the theory when it was first propounded.

It is useless to talk of theories which only suit imaginary worlds, or void space, where bodies are supposed to move without a force.

Here we are surrounded by an atmosphere, and where bodies only move by the aid of some active principle; therefore, when we discuss physical questions, or theories of projectiles—which are intended to be of service—these points must always be borne in mind.

An arc of equal angles at each extremity is made on the *supposition* that a projectile has a *uniform* motion, and not a decrescent one (see the parallelogram). How can a *projecting* force produce a *uniform motion?*

The reason why the paragraph from Sir J. Herschel's Astronomy has been quoted is because it is in accordance with the illustration contained therein, on which the mathematical theory of projectiles has been founded.

We do not question the importance and great advantages of pure mathematical exercises on the laws of geometry, &c.; it is the *assumed physical laws* which have been amalgamated with these exercises that are brought to account. The advantages derived from the use of the former may be injured in their practical application by an injudicious and questionable mixture of the latter. The attempts at making rectilinear and curvilinear figures equivalent by reduction and cutting off corners, must be considered as merely the merging into indivisibles and inadmissibles, if there be any truth in the laws of geometry. The same with the resistance of the air and gravitating forces, combined with a projectile or expanding and evanescent force; we must compound them strictly, as they are to arrive at the true resultant path. When our mathematical reasoning and deductions are founded on the actual conditions of things, the results must necessarily always be in accordance with those found in practice. It is only when mathematicians *assume different circumstances and conditions, unknown in nature,* that they fall into errors. No man of understanding will decry mathematics. They are indispensable elements in reducing our practical data to a system. It is the erroneous physical assumptions

[redacted]

which are contrary to facts, and enveloped in mathematical symbols, stamping the former, at the expense of the latter, with infallibility; or, in other words, making them to appear like the self-evident truths of geometry, that are brought into question. Therefore let the two be kept separate.

The letter of "A Mechanic" requires no comment; but if he intends to continue the discussion, I trust he will not forget what is the subject under consideration. There is nothing that tends to weaken an argument more than that of dwelling on subjects foreign to the question in dispute—more especially when these are mixed with loose assertions and personalities, leaving the original question untouched.

I am, Sir, yours, &c.,

EVAN HOPKINS.

38, Thurloe-square, Brompton, Aug. 29.

To the Editor of the Mechanics' Magazine.

SIR,—I wish your correspondent, "A Mechanic," would keep himself to the question at issue, instead of making such a rambling and somewhat contradictory reply, and yet concluding his letter with the following remarkable observations, viz., "That Herschel has stated this somewhat loosely, may be true; and if any one pleases to criticise him on that account, I have nothing to say."

This is a strange way of defending a theory which is held in such high veneration by mathematicians.

I have no desire to imitate your correspondent in his discursive mode of discussing the question, although I could easily point out many discordancies in his several paragraphs.

I must again return to the data on which the two parallelograms of the paths of projectiles are founded. By direct experiment "A Mechanic" will find that a body projected at an angle of 90° does not move in equal spaces in equal times. On the contrary, it gradually diminishes until it finally stops, and then returns by the force of gravity. The extent of the path depends on the amount of the projecting force and the resisting medium.

In water, the length of the path would be much less than in air; and in a very rarified air the length of the path would be much greater, and still more so in vacuum.

Your correspondent had better make such experiments himself; it is the only way of convincing himself of the truth of what I maintain, which is, that bodies projected by an impulsive force move with a constantly decreasing velocity in vacuum, as well as in air, &c.

Let him furnish himself with three long glass tubular columns of about 4 or 6 inches in diameter. Place one of these on an air-pump, with a small projectile attached to the bottom. The second tube on another small projectile, the air remaining within; the third, filled with water, and a projectile below. It will be observed that the vertical paths of the three projectiles only vary in their length—all three commence at maximum speed, and ultimately stop in their upward course and return again to the bottom, the body propelled in the vacuum reaching the highest elevation. Thus we find, experimentally, that a projectile force is necessarily of an evanescent quality, and cannot possibly move in equal spaces in equal times. This being, then, a well-ascertained fact, I wish to know how, or on what ground, mathematicians still teach the parallelogram of equal sides to represent a constant force to the projectile?

Your correspondent states that "It is well known that the problem of curvilinear motion in a resisting medium is peculiarly difficult; first, because the law of resistance is almost unknown; second, because no known method of analysis will touch the question under those conditions which seem to come nearest to the facts."

I beg leave to join issue, and maintain that there are no difficulties whatever attending the problem, provided we first determine the amount of resistance presented by the medium, and make our parallelograms accordingly. We can easily determine the resistance of the air and water; both are constant quantities,—it is the propelling force that varies. A very elegant method of demonstrating the facts, and showing the paths of projectiles at different angles in different media, is by means of a small syringe fixed on a pivot to a pillar, and supplied with quicksilver, the whole being enclosed in an air-tight glass case.

The streams of quicksilver in water, air, and vacuum describe paths of the same kind, and become vertical from 90° to 45°, on falling at the level of the projecting point. The only difference between the path in vacuum and of that in air is simply that the latter is much shorter than the former, with an equal force. I could furnish your correspondent with many other modes of proving my argument, therefore I trust he will do me the favour of showing on what data mathematicians have formed their equal spaces in equal times, by which they make the theoretical arc of projectiles.

I am, Sir, yours, &c.,

CIVIL ENGINEER.

August 27.

IMPOSSIBLE EQUATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—In your No. 1663 (page 583) Mr. Wilkinson mentions an impossible equation

$$+\sqrt{1+x}+\sqrt{1-x}=1.$$

I have not seen the journal in which he says that it was proposed and afterwards solved by showing that it has no real or imaginary root; but I consider this mysterious impossibility quite unworthy of the philosophical speculation that has been bestowed upon it, as it is plainly the result of an algebraical sleight of hand, by operating with the wrong sign of a square root.

We find, as stated, $x=\pm\frac{\sqrt{3}}{2}$. Inserting the positive value of x, the origin of the equation is traced thus:

$$(1.)\ \sqrt{1+\frac{\sqrt{3}}{2}}=1-\sqrt{1-\frac{\sqrt{3}}{2}};$$

$$(2.)\ 1+\frac{\sqrt{3}}{2}=1-2\sqrt{1-\frac{\sqrt{3}}{2}}+1-\frac{\sqrt{3}}{2}.$$

$$(3.)\ 2\sqrt{1-\frac{\sqrt{3}}{2}}=1-\sqrt{3}.$$

$$(4.)\ 4-2\sqrt{3}=1-2\sqrt{3}+3.$$

Each of the members of the equation (3) being the square root of the corresponding member of the equation (4), it should have been stated:

$$\pm 2\sqrt{1-\frac{\sqrt{3}}{2}}=\mp(1-\sqrt{3}).$$

When the left side is taken positive, the second must be taken negative, and *vice versâ.*

The proposed equation is derived from the false assumption of

$$+2\sqrt{1-\frac{\sqrt{3}}{2}}=+(1-\sqrt{3}).$$

If the equation

$$2\sqrt{1-\frac{\sqrt{3}}{2}}=-1+\sqrt{3}$$ is brought into the same form as the proposed one, and x is substituted for $\frac{\sqrt{3}}{2}$, we obtain

$$\sqrt{1+x}-\sqrt{1-x}=1.$$

In fact, by inserting the value of x in the proposed equation and performing the calculation, we find the first term on the left $=1\cdot36602$, and the second $=0\cdot36602$; clearly showing that an error of signs has been committed in the operations which have led to the equation.

I am, Sir, yours, &c., ERGO.

Manchester, Aug. 24, 1855.

THE BAROMETRICAL PARADOX.

To the Editor of the Mechanics' Magazine.

SIR,—There is a remarkable phenomenon in atmospheric pressure, as indicated by the barometer, which has often been commented upon, but not, that I am aware of, well accounted for, viz., the fact of the air being shown to be lighter when charged with water in the form of vapour (and when, judging only by our senses, we should say the air is heavier) than it is when a great quantity of water has been discharged from the clouds and the air is comparatively dry. Now this paradox, for such it appears, can, I think, be explained on mechanical principles connected with the earth's rotation. For as the earth in its rotation carries with it the surrounding air, in velocities corresponding with the different heights, and as *there is a height at which* the rotating air will acquire by its velocity a centrifugal force equal to its central force, all the air which may extend beyond that altitude will be without weight as respects the barometer. If, then, the space containing air having weight be limited, and if that space be occupied, or partly occupied, by a body lighter than air, the pressure on the barometer will be proportionally less. Now the vapour of water is evidently lighter than air, or it would not rise in it. Therefore the more aqueous vapour there is in a given bulk of air, the lighter it will weigh; and this is exactly what our barometers indicate.

I am, Sir, yours, &c.,

URIAH CLARKE.

Leicester, August 22, 1855.

[redacted]

RUSSIAN FLEET AT CRONSTADT.

To the Editor of the Mechanics' Magazine.

SIR,—I quite agree with the remark made on page 131 of your Journal, of August 11, (No. 1670), by your correspondent, "A Reader," and am myself persuaded "that the helpless attitude of England and France before the fortresses of Russia, has resulted from the fact that, from some cause or other, these two nations are unable to cast even a tithe of the scientific skill which they possess into their war treasuries." At the same time, I think some of your correspondents would do good service, if they devised, and forwarded to you for publication, practical methods by which damage might certainly be done to the enemy. One subject to which they might turn their attention, is the destruction of the Russian fleet at Cronstadt by fire. I see no reason why this should present any great difficulty, and I think scientific men might very well employ their leisure in contriving the arrangements necessary to effect it.

I am, Sir, yours, &c.,

ANOTHER READER.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

RITCHIE, GEORGE, of Monmouth-place, New Cross, New Kent-road. *Improvements in beds or mattresses.* Patent dated February 2, 1855. (No. 250.)

This invention has for its object the manufacture of beds or mattresses to be used on the ground, and on other wet or damp surfaces, and consists in constructing them of light waterproof materials, in such manner as to give a soft and impervious medium to lie on in a small portable package convenient for transport.

CASTEL, JULES, merchant, and FREDERICK MAURICHEAU BEAUPRÉ, doctor, of Marseilles, France. *A new system of burners for lamps, called the "pyropneumatic burner."* Patent dated February 2, 1855. (No. 251.)

This system of burners is mainly distinguished by several novel forms of the wick tube, in which the round or hose-like wick of oil lamps is fixed. In the present case this part is either made to taper outwards near the top, or else it is made conical, tapering from the bottom towards the top, the object being to protect the wick from currents of air, and thus prevent it from charring.

CARLHIAN, ISIDORE, and ISIDORE CORBIERE, of Castle-street, Holborn, London, and Rue du Sentier, Paris, lamp manufacturers. *Certain improvements in moderator lamps.* Patent dated February 2, 1855. (No. 252.)

These improvements consist in enclosing the pinion that serves to wind up the rack which works in the centre of the body of the lamp, so as to prevent it from being clogged by dust and other impurities.

THOMAS, FREDERICK SAMSON, of Cornhill, London, and WILLIAM EVANS TILLEY, of Kirby-street, Holborn, Middlesex. *Improvements in plating or coating metals.* Patent dated February 3, 1855. (No. 253.)

This invention consists in plating or coating metallic surfaces with alloys formed of any two or more of the following metals, viz., tin, silver, nickel and copper, by forming solutions of the metals composing the intended alloy in any suitable way, then mixing the solutions in any desired proportions, and finally depositing the alloy upon the articles to be plated by means of a battery.

CRANE, PATRICK MOIR, of Athy, Kildare, manager of works. *Improvements in the manufacture of products from peat.* Patent dated February 3, 1855. (No. 254.)

These improvements "consist in having a separate chamber or compartment adjoining the furnace of combustion for distilling the peat and saving the charcoal, and in the adaptation of the furnace of combustion for other fuel besides peat as now used."

CHANCE, JAMES TIMMINS, of Birmingham. *Improvements in the manufacture of pipes or tubes of glass or other vitreous matter.* Patent dated February 3, 1855. (No. 255.)

This invention consists in forming tubes of glass or other vitreous matter by bending sheets or fillets of it over mandrels or otherwise, so that the edges may overlay, or come together, and be welded by pressure.

MARYON, ROBERT JAMES, (engineer, civil), of York-road, Lambeth, Surrey. *Improvement or improvements in the construction of and manufacture of bullets, or shot, or projectiles.* Patent dated February 3, 1855. (No. 256.)

This invention consists in constructing bullets or shot (either large or small) with external curvilinear incline planes, extending from the fore part towards the cartridge end, to the extent of about one-third the length of the bullet or shot, these angular incline planes being formed of a wedge shape, and of as much of a turn of a screw as is practicable.

CLEGG, EDMUND, of Shore Mill, near Littleborough, Lancaster, and JAMES LEACH, of the same place, manufacturers. *Improvements in temples for looms.* Patent dated February 3, 1855. (No. 258.)

This invention consists in the adaptation of rotatory combs to temples of the ordinary construction so as to render them self-acting; and for the purpose of securing a

suitable position of the cloth for being continuously held the inventors adapt bent pieces to the temple which guide it towards the peripheries of the combs, or they adapt suitable guides to any stationary part for the same purpose.

ALLAN, THOMAS, of Adelphi-terrace, Westminster, civil-engineer. *Improvements in obtaining and transmitting motive power.* Patent dated February 3, 1855. (No. 261.)

Claims.—1. The transmitting of motive power by means of cross-head slides acting on two crank shafts rotating reversely, and caused to act in combination. 2. A mode of obtaining motive power in electro-magnetic rotary engines by applying the attractive forces of magnets to the sides of a rotating disc or wheel in lieu of the periphery as before practised.

PATTISON, GODFREY, of Glasgow, Lanark, merchant. *Improvements in machinery for dressing and finishing woven goods or fabrics.* (A communication.) Patent dated February 5, 1855. (No. 263.)

Claims—1. The combination of a stationary drying-cylinder with a pair of hoops, rings, discs, or wheels, having an alternate intermittent rotary motion, for the purpose of effecting an alternate oblique strain of the texture of a woven fabric at the time that it is being dried. 2. The adaptation to the purpose of drawing off and delivering such woven fabric from the said hoops, rings, discs, or wheels, of rollers having an alternate intermittent rotary motion corresponding with that of the hoops, rings, discs, or wheels, in combination with a roller divided into segments. 3. The combination of oblique tenter-wheels for stretching the woven fabric with, and their adaptation to the said hoops, rings, discs, or wheels. 4. The application of a pair of rotating brushes to press the selvages of the woven fabric on to the teeth or pins of the hoops, rings, discs, or wheels.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture or construction of steam boilers or generators, and in the application of materials to such manufacture.* (A communication.) Patent dated February 5, 1855. (No. 265.)

Claim.—"The application and use of cast steel in the form of large plates, and in the form of bolts, screws, and rivets, to and in the manufacture or construction of steam boilers or generators."

MORTON, ALEXANDER, of Kilmarnock, Ayr, manufacturer. *Improvements in weaving carpets.* Patent dated February 5, 1855. (No. 266.)

Claims.—1. A general described arrangement and construction of mechanism or apparatus to be applied to hand looms for weaving carpets. 2. A mode of weaving Brussels carpets wherein the sheds for the binding weft shots are formed first above and then below the main line of woollen warp threads, the weft shots being thrown in at two different levels without disturbing the woollen warps. 3. The application and use in hand looms for weaving carpets of "brakes" for holding or tightening the woollen warp threads during the formation of the shed in these threads. 4. A mode of working hand looms for weaving Brussels carpets with the "fly shuttle." 5. The application and use in hand looms for weaving "two fly" and "three fly" carpets, of stuffing shuttle boxes for working the shuttles, such boxes being actuated by an independent treadle movement, or by the Jacquard action.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *An improved mode of preserving railway and other tickets.* (A communication.) Patent dated February 5, 1855. (No. 267.)

The inventor proposes to employ a ticket-holder which can be attached to the button hole of the coat, or any other convenient and visible part of a garment, the advantage of it being that the traveller is spared the inconvenience of a frequent exhibition of his ticket to the railway or other officials.

HARTNALL, EBENEZER, of St. Mary Axe, *Improvements in preserving animal and vegetable substances for food.* Patent dated February 5, 1855. (No. 269.)

This invention consists in coating the substances to be preserved with mixtures of gelatine and treacle. On being exposed to the air the coating becomes hardened, but is as elastic as India-rubber, and the meat is hermetically sealed. A second coating may be applied when the first has set, and the meat be immediately wrapped in canvas which firmly adheres to it.

IMRAY, JOHN, engineer, of Bridge-road, Lambeth, Surrey. *Improvements in measuring instruments.* Patent dated February 5, 1855. (No. 270.)

The instrument described by the inventor consists of a graduated bar on which an inclined mirror is mounted, so as to slide recticilineally, and another half-silvered mirror is fixed opposite an eye-piece or telescope, so that when the inclinations of the mirrors are properly adjusted the distance of an object from the fixed mirror is ascertained by moving the sliding mirror along the bar a proportional distance from the fixed mirror, as determined by the coincidence of the direct and reflected images of the observed object.

GIBBONS, JOSEPH, of Oxford-street, Middlesex. *An improvement in fixing the spindles of door locks to their knobs.* Patent dated February 5, 1855. (No. 271.)

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In carrying out this invention each spindle is formed with a slit or slits at one or both ends, and on one side of the spindle is fixed a plate of steel or elastic metal. The knobs as heretofore have screws which pass into their shanks, and the inner end of each screw on coming against the spring, near the end of the spring plate, bends out that end so as to enlarge the spindle. The passage in the shank of the knob is inclined or enlarged inwards, to admit of the end of the spring plate being bent outwards, so that the knob can be slided on its spindle into position, and be then fixed by expanding the size of the spindle, either by a screw or other suitable means.

Daft, Thomas Barnabas, of the Isle of Man, Esq. *Improvements in the manufacture of beds or surfaces to recline or lie on.* Patent dated February 5, 1855. (No. 273.)

This invention consists in combining a series of tubes or hollow cells of India-rubber or gutta percha, or compounds of these substances, so as to produce the extent of surface desired.

Hoare, Deane John, of Salisbury-street, Strand, Middlesex, Esq. *Certain improvements in propelling vessels.* Patent dated February 6, 1855. (No. 274.)

This invention "consists in applying the screw propeller in all cases at an angle: for example, when one screw is used in the dead wood of a ship the screw must be placed with its axis at such an angle as may be produced by drawing a line from the centre of propulsion in the boss of the screw along the centre line of the keel up to the centre of gravity or motion of the vessel."

Gray, Frederick, of Birmingham, Warwick, manufacturer. *An improvement or improvements in candlesticks.* Patent dated February 6, 1855. (No. 278.)

Claim.—Making the slots in candlesticks which are furnished with a lift of such a form that the lift may be retained at certain points of the slot, by being raised to the said points and dropped into lateral slots situated at the said points.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the combination of materials for waterproofing and similar purposes.* (A communication.) Patent dated February 6, 1855. (No. 280.)

In carrying out this invention tar, shellac, India-rubber, litharge, and a preparation of zinc, lead, or other chemical substance, having similar properties, are thoroughly mixed, worked together, and exposed for several days to a heat of about 130° Fah. being frequently agitated or stirred during that time, as much of the tar preparation being added as is found necessary to make the whole capable of being readily worked.

Smith, Peter, of Glasgow, Lanark, machine maker. *Improvements in machinery or apparatus for printing textile fabrics and other surfaces.* Patent dated February 6, 1855. (No. 281.)

This invention mainly consists of a mode of removing and replacing the printing rollers or cylinders of machines for printing textile fabrics and other surfaces by means of a traversing frame combined with suspensory chains, or cords, and winding apparatus, these details being specially adapted to or forming part of certain described machines.

Roberts, William Sandford, of Lodersville, Pennsylvania, United States of America. *Coupling railway carriages.* Patent dated February 6, 1855. (No. 282.)

The patentee describes a coupling apparatus in which is employed a simple oblong iron ring, like the link of a chain, which, when it is in its place in one coupling box, has its other part projecting beyond a bell-mouthed flanch, so that when another car is run up to it this link enters the flanch thereof, and forcing the hooks upwards, passes under it and is caught as it springs down without any aid from the attendants, being so arranged that while the carriages run straight the coupling holds, but loosens as soon as one of them diverges from the rails.

Audemars, George, of Lausanne, Switzerland. *Improvements in obtaining and treating vegetable fibres.* Patent dated February 6, 1855. (No. 283.)

This invention mainly consists "in obtaining fibres from the bark of the mulberry tree and other trees of the genus morus."

Grainger, John, of Birchwood, Alfreton, Derby, brickmaker. *Improvements in the manufacture of pantiles.* Patent dated February 6, 1855. (No. 284.)

This invention consists in forcing clay or brick earth through dies formed with openings corresponding with the transverse sections of the sizes of pantiles to be made, by which means is obtained a continuous sheet, the transverse section and longitudinal contour or bend of which correspond with those of the intended pantiles.

Fontainemoreau, Peter Armand Lecomte de, of South-street, London. *An improvement in the mode of applying as motive power heated air, combined with the vapour of ether, or of any other liquid easily vapourised.* (A communication.) Patent dated February 7, 1855. (No. 285.)

This invention comprises—1. An arrangement of cylinders, pistons, and cross-pieces, and an air-pump, composed of a cast cylin-

dermounted with double-action valves, which serves to supply the boiler with air, which enters first into a receiver placed upon the boiler. Two pumps, one for the cold condensing water, and the other for the ether, serve to return the condensed ether to the vaporiser. 2. An apparatus to collect the heat of the expanded air after it has ceased to act in the cylinders, which apparatus consists of a chamber furnished in the interior with a large quantity of sheets of wire-gauze placed round the chambers. 3. An apparatus for evaporating the ether, which apparatus is composed of a hollow screw revolving on a hollow core or cylinder. This apparatus contains sulphuric ether, and the air heated by the furnace, after having performed its expansion in the large cylinder, passes between these partitions round the core for the purpose of evaporating the ether until it arrives at the top of the cylinder; it then passes into the heating chamber, where it escapes. 4. An ether condenser, which is constructed on the same principle as that described for the evaporator, substituting cold water for the hot air.

WARBRICK, WILLIAM, of Dukinfield, machine-maker, and JOHN WALKER, of Compstall-bridge, near Stockport, mechanic, both in Chester. *Certain improvements in machines for preparing, spinning, doubling, warping, and dressing cotton, wool, and other fibrous substances.* Patent dated February 7, 1855. (No. 286.)

Claim.—The application, adaptation, and arrangement of double-action cams for traversing the slivers or threads between the rollers of preparing, spinning, or doubling-machines; also certain weighted single-action cams.

BOUSFIELD, GEORGE TOMLINSON, of Sussex-place, Brixton, Surrey. *Improvements in looms for weaving ornamental figured fabrics, and in the construction of the rollers to be used upon the pattern chains of such looms.* (A communication.) Patent dated February 7, 1855. (No. 290.)

This invention consists—1. In placing two or more patterns upon a single chain, so that by bringing the rods of the chain into operation in a certain order one pattern is produced, and by operating them in a different order another pattern is produced. 2. In placing two or more patterns side by side upon the rod of a pattern chain, and operating them in succession by vibrating the chain laterally. 3. Pivoting the rods which raise and depress the jacks at one end, the other end being adjustable. 4. The construction of pattern chain rollers, the bearing parts of which are formed of wrought iron tubes, on which iron bodies are cast.

BRIGGS, GEORGE, of Wigmore-street, Middlesex, carriage-builder. *An improved spring for carriages.* Patent dated February 7, 1855. (No. 293.)

This improved spring consists of an under elliptical spring, the top plate of which is turned up at each end so as to form an eye for the reception of the ends of a leather brace. This brace is stretched under the upper spring, which is flattened at top and extended at the base. The upper spring and brace are held together by clips.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved construction of spur.* (A communication.) Patent dated February 7, 1855. (No. 294.)

The object of this invention is so to construct spurs as to admit of their being fitted on to boot-heels of various sizes. For this purpose the clasp of the spur is constructed of two arms which are jointed to a central threaded stem that carries the rowels of the spur.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved mode of constructing dry docks.* (A communication.) Patent dated February 7, 1855. (No. 295.)

This invention consists in making use of the natural clay foundation for the floor of the dock, the sides and back end being formed of piles, the puddling between the inner and outer piling resting upon the clay floor, and forming a continuation of it after the manner in which coffer dams are puddled.

HARTFIELD, WILLIAM, of Prospect-row, Bermondsey, Surrey, tortoise-shell worker. *Making book-covers in tortoise-shell, inlaid or not with pearl or ivory; and for improvements in machinery for embossing, carving, and inlaying book-covers with pearl and ivory; and for making metal joints, by which such book may be widely opened; the said improvements to be applicable to inlaying pianofortes.* Patent dated February 7, 1855. (No. 296.)

This invention mainly consists in making book-covers of tortoiseshell, or of wood veneered with tortoiseshell, such tortoiseshell being plain or inlaid with pearls, ivory, or other substances in use for inlaying. The backs of these book-covers may be of leather or velvet. The inventor makes the joints of the covers of metal drawn through a draw-plate, and stamps out the tortoiseshell with suitable dies.

GIRARD, ADOLPHE, chemist, of Pertuis, department of Vaucluse, France. *Certain improvements in extinguishing fires.* Patent dated February 8, 1855. (No. 298.)

The fire-extinguishing apparatus described by the inventor comprises—1. A distributing pipe perforated with fine apertures for producing jets of gas. 2. A box, of wood or other suitable material, cased

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internally with lead, and containing pieces or powder of carbonate of lime, or of white marble. 3. Another box cased with lead inside, and containing common chlorhydric acid. There is a pipe for connecting the upper portions of these two boxes, a cock in the said pipe allowing the communication between them to be intercepted. By means of another pipe a communication is established between the bottom of the chlorhydric acid box and the top of the box containing the carbonate of lime; when a fire is to be extinguished, the distributing pipe being supposed to be in or near the place where the fire breaks out, the communication pipe is first opened, and in consequence of the acid running into the lime, carbonic acid is generated, and this is then allowed to pass out by the distributing pipe.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Patterson, John, of Beverley, York, engineer. *Improvements in machinery or apparatus for washing, wringing, and mangling for pressing cloths or textile fabrics.* Application dated February 3, 1855. (No. 257.)

This invention consists in the employment of a press in connection with a washing vessel or cistern containing the washing liquid. This press is placed immediately over the water and is so arranged that the pressing surfaces between which the clothes or fabrics are placed shall be submerged, or the press is made to let down into the water at pleasure. The washing is effected by alternately allowing the cloths or fabrics to absorb the washing liquid and then pressing it out again.

Lippmann, Isaie, of Rue Geoffroy, Saint Hilaire, Paris, France, tanner. *An improved method of dyeing or colouring the hides and skins of animals.* Application dated February 3, 1855. (No. 259.)

This invention consists in dyeing or colouring the skins or hides, before they are tanned, by the means employed in colouring vegetable substances.

Bertoche, Hippolyte Victor Pinondel de la, gentleman, of Paris, French Empire. *Certain improvements in manufacturing paper, pasteboard, and pulp.* Application dated February 3, 1855. (No. 260.)

This invention mainly consists in the employment of the root of the asphodel plant, and the remains of such root after distillation, in the manufacture of paper, &c.

Bisshopp, Edward Cecil, of Stonehouse, Devon. *Improvements in breech-loading fire-arms.* Application dated February 3, 1855. (No. 262.)

The barrel of Mr. Bisshopp's fire-arm, at its breech end, is made into an open frame suitable for receiving a moveable breech, in such manner that, the axis of the breech being below, the breech may move thereon to one side, out of the line of the barrel, and in that position be loaded like the several breeches of a revolver.

Dorrell, John, of Bilston, Stafford. *Improvements in machinery for pressing, squeezing, and rolling iron.* Application dated February 5, 1855. (No. 268.)

This invention consists in constructing and combining mechanism in the following manner. "Between two side frames is formed a curved bed partly of bars with spaces between them and grooved on their surfaces. A grooved roller is placed within the curved bed, which bed commences at a point below the roller, and somewhat forward of it, and the bed proceeds upwards over the roller and comes somewhat beyond the roller. The bearings of the axis of the roller are made capable of being set nearer to or farther from the back of the bed; hence the passage between the roller and the back of the bed may be varied. The entrance to the space between the bed and roller is larger at the commencement than at the other parts, and the two sides of this space are made to move so that the space may be contracted, and such contraction depends on weighted levers or other mechanism, so that as the iron progresses by the revolution of the roller through the space between the roller and the fixed bed the mass of iron is contracted in width; and the machinery may be so arranged that the iron may descend or move in a trough from the machine above described to a pair of rollers, to be rolled into a slab or otherwise."

Carré, Pierre Joseph, of Asnieres, Seine, France. *Improvements in ornamenting fabrics with metal leaf.* Application dated February 5, 1855. (No. 272.)

This invention consists in embossing fabrics, and in printing or covering the embossed parts with metal leaf. The fabric to be thus ornamented is cemented or fastened on to paper, card-board, or other suitable material, and is then embossed by a block on which a suitable pattern is cut, and is at the same time printed with a suitable mordant for attaching the metal leaf.

Gedge, John, of Wellington-street South, Middlesex. *Improvements in frames suitable for photographic or stereoscopic proofs or portraits.* (A communication.) Application dated February 6, 1855. (No. 275.)

Instead of the frames at present in use for receiving and protecting stereoscopic or photographic proofs or portraits, the inventor proposes to make frames by which a

certain distance shall be preserved between the prepared glass and the proof or portrait, making the back framing in such manner as to secure that object.

TRAPPES, HENRY, of Manchester, Lancaster, gentleman. *A process for the preparation of leather to be used in the manufacture of a new flock, and for the manufacture of the same, to be used and applied in lieu of flock made from pounded or ground wool and woollen materials, heretofore commonly used in the manufacture of painted, printed, and dyed decorating papers, carpets, oilcloths, and other things, and also to be used as a paste or pulp for the manufacture of all kinds of paper, parchment, and pasteboard, of toys, or ornamental and other picture-frames, of mouldings, architectural and sculptural ornaments, and other things.* (A communication.) Application dated February 6, 1855. (No. 276.)

In carrying out this invention leather is ground in a mill, soaked in water, washed, bleached, re-ground by mill-stones, drained, re-washed, and then dried. The leather pulp or paste thus produced is then repassed and re-ground in a mill similar to the one used in the first instance for the trituration of the leather, but somewhat finer, so as to reduce it to a powder, and afterwards sifted through a sieve.

ASTON, THEOPHILUS, of Compton-street, Regent's-square, Middlesex. *Improved apparatus and means for enabling persons conveyed in carriages to communicate with the drivers or conductors thereof.* Application dated February 6, 1855. (No. 277.)

The inventor provides a signal-box furnished with apparatus so contrived and connected with other apparatus fixed inside the vehicle, that a person inside may be enabled at his pleasure to cause the signal-box outside to exhibit certain signals, written, printed, or painted in any convenient manner, and at the same time cause a hammer to strike a call-bell fixed in the box.

WARNER, ARTHUR, of New Broad-street, London, merchant. *Improvements in coating or combining sheet iron and steel, with sheet lead, zinc, tin, copper, or alloys of such metals.* Application dated February 6, 1855. (No. 279.)

This invention consists in coating or combining sheet iron and sheet steel with sheet lead, zinc, tin, copper, or alloys of such metals, by applying soldering metal between them, and subjecting them to heat, whilst pressed together in a flat or nearly flat state, the heat being applied through one or both of the metals, so as to melt the soldering metal.

JOHNSON, JOHN GROVE, of Basinghall-street, London. *Improvements in surgical bandages.* Application dated February 7, *1855. (No. 287.)*

This invention consists in applying straps or other forms of fabric prepared with adhesive materials, in order to attach them to the sound flesh, such straps or fabrics having fixed thereto sheet metal or other forms of light hooks or fastenings, to admit of flexible elastic straps of India-rubber, or other suitable elastic materials being attached thereto, in order to draw the cut or divided parts together, and to retain other bandages, coverings, or dressings placed thereon.

BOUSFIELD, GEORGE TOMLINSON, of Sussex-place, Brixton, Surrey. *Improvements in steam ploughing machines.* (A communication. Application dated February 7, 1855. (No. 288.)

The inventor describes an arrangement of parts combined into a steam ploughing machine, in which the ploughs "consist of a mould board and land side only; the land side is of a size sufficient only to resist the pressure of the mould board, being full at or near the coulter, and tapering to a point backwards, so that in ploughing with all the ploughs in a parallel line, side by side, one plough shall turn the earth against the back side of the mould board of the adjacent plough."

CHATTERTON, RICHARD DOVER, of Cobourg, Canada West. *Improvements in propelling vessels.* Application dated February 7, 1855. (No. 291.)

The inventor employs as floats a number of hollow or buoyant cylinders, each of which is arranged to turn on its own axis, and the wheels are made of comparatively large diameter, so that the lowest buoyant cylinder of a wheel may descend into the water to a greater depth than the keel of the vessel; and he prefers to employ two, or even more, of such wheels on each side of a ship.

HOFFSTAEDT, AUGUSTUS JOHANN, of Albion-place, Blackfriars, and SAMUEL BLACKWELL, of Oxford-street. *An improvement in powder-flasks and shot-belts or pouches.* Application dated February 7, 1855. (No. 292.)

This invention consists in employing springs of vulcanized or permanently elastic India-rubber as springs to act on the slides or valves of powder-flasks and shot-belts or pouches.

WILSON, JOHN, of Manchester, calico printer. *Improvements in the manufacture of rollers for printing and embossing calico and other fabrics.* Application dated February 8, 1855. (No. 297.)

The rollers hitherto employed for printing and embossing calico and other fabrics, have been made of copper or of alloys of copper, but this invention consists in manufacturing such rollers of zinc, or of alloys of zinc, the

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object being to produce rollers at less expense than heretofore.

PULS, FRANCIS, of Soho-square, Middlesex, chemist. *Certain improvements in apparatus to be used in smoking tobacco.* Application dated February 8, 1855. (No. 299.)

These improvements consist in the construction and application of finely-perforated plates composed of metal, glass, china, clay, or other suitable material, and of various sizes and configurations, so as to admit of their being inserted at pleasure near the lower part of the bowl of the various tobacco pipes, to which they are specially adapted, in such manner that the oily and narcotic substances evolved from the tobacco in smoking may percolate through them, and be carried away from the remaining tobacco.

ARMSTRONG, JOSEPH, of Normanton Station, Wakefield, York. *Improvements in certain parts of the permanent way of railways.* Application dated February 8, 1855. (No. 300.)

The inventor constructs railway chairs in which, as certain nuts are tightened up, a hollow taper wedge is forcibly pressed against the sides of the two rails. The chairs at the junction of two lengths of rail are larger than the others.

PROVISIONAL PROTECTIONS.

Dated May 16, 1855.

1110. John Knowles, of Manchester, Lancaster, marble merchant, and Edward Taylor Bellhouse, of the same place, engineer. Improvements in the manufacture or working of marble, stone, glass, and similar materials.

Dated July 18, 1855.

1608. Walter Christopher Thurgar, of Norwich, surgeon. The preservation of the fluid substance of fresh eggs.

Dated July 19, 1855.

1638. Samuel Stocker, of Brighton, Sussex, engineer. Improvements in waterclosets, and in pumps and cocks for supplying water to the same, and for other similar purposes.

Dated July 26, 1855.

1697. John Hunt, of New Kent-road, Surrey. An expanding and contracting self-fastening band.

1699. William Brown, of Bradford, York, machine wool-comber. Improvements in machinery or apparatus for combing wool and other fibrous substances.

1701. Christopher Thompson, of South Shields, Durham, engineer. Certain improvements in furnaces, with a view to the prevention of smoke.

1703. Charles Goodyear, of Avenue-road, St. John's-wood, Middlesex. An improvement in the manufacture of gunpowder. A communication.

1705. William Mardon, of Christchurch-chambers, Newgate-street, London, solicitor. An improvement in treating garancine. A communication.

Dated July 27, 1855.

1707. Charles Hodges, of Manchester, Lancaster, manufacturer and merchant. Improvements in machinery and apparatus for knitting plain, ribbed, or figured hosiery. A communication from John Pepper and Thomas Appleton, of Franklin, United States.

1709. Peter Effertz, of Aix-la-Chapelle, Prussia, engineer. Improvements in machinery for cutting, creasing, or marking paper, card, and pasteboard, and other like substances.

1711. Charles Felton Kirkman, of Argyle-street, Regent-street, Middlesex, gentleman. Certain improvements in machinery for spinning and twisting cotton, silk, flax, wool, hemp, and other fibrous substances.

1713. Andrew Smith, of Manchline, Ayr, gentleman. Improvements in portable cases or holding-receptacles for cigars, spectacles, cards, cutlery, and other articles.

Dated July 28, 1855.

1717. Henry Heaton Barry, of Bedford-street, Strand, Middlesex. Improvements in machinery for combing and carding wool, flax, mohair, and other fibrous substances.

1719. John Hyde, of Sheffield, York. Improvements in furniture-castors.

1721. William Brownfoot, of Leeds, York, cabinet-maker. A new or improved instrument or apparatus for raising, lowering, and adjusting blinds, maps, and other such like articles.

1723. Frederick Willis, of King-street, St. James's, Middlesex. An improvement in the manufacture of wine-bottles.

1725. Charles Goodyear, of Avenue-road, St. John's-wood, Middlesex. Improvements in manufacturing covers for floors, when compounds of India-rubber are used.

Dated July 30, 1855.

1727. Joseph Marie Fillier, of Rue de l'Echiquier, Paris, France, merchant. Certain improvements in looms for weaving.

1729. William Fletcher Coles, of Paul-street, Finsbury. An improvement in the manufacture of boots and shoes.

1731. Thomas Clunes, of Aberdeen, plumber. Improvements in pumps and fire-engines.

1733. James Hirst Whitehead, of Mowville, Burley, York, gentleman. Improvements in the construction of steam-boiler furnaces.

Dated August 1, 1855.

1741. Samuel Mellor, of Salford, Lancaster, mechanic, and Thomas Young, of Manchester, tobacco manufacturer. Improvements in machinery for supplying water to steam-boilers.

1743. John Clarke, of Leicester. Improvements in machinery for making loop fabrics.

1745. Georges Bufnoir, merchant, of Lyons, France. Certain improvements in stopping bottles and other vessels.

Dated August 2, 1855.

1747. Alexander Allen, of Perth, engineer. Improvements in the valve gear of locomotive and other engines.

1749. James Saunders, of Newgate-street, London, clothier. An improved roller for cloths and other fabrics.

1751. Rudolph Bodmer, of Thavies-inn, Holborn, London. Certain improvements in rotatory steam-engines. A communication from Mr. Grainicher, of Natchez, United States of America.

Dated August 3, 1855.

1757. Auguste Edouard Loradoux Bellford, of Essex-street, Middlesex. Certain improvements in grinding-mills. A communication.

1759. George Henry Fullard, of Thorney, Cambridge, farmer. An improved pin for thatch coverings for stacks and roofs.

1761. John Charles Alexander Pfaff, of Wiesbaden, Grand Duchy of Hesse, engineer. Improvements in obtaining and applying motive power.

1763. Henry John Betjemann, of New Oxford-street, Middlesex. Improvements in extending tables. A communication.

1765. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of metallic waterproof fabrics or materials, and in the applications thereof. A communication from Nicolas Ernest Theophile Petin, of Montmartre, near Paris, France, gentleman.

1767. Robert Richardson and Walter Greenshields, of Douglas, Isle of Man, manufacturers. Improvements in Chenille fabrics.

Dated August 6, 1855.

1774. John Macintosh, of Great Ormond-street, Middlesex. Certain improvements in the application of incendiary materials to be used in warfare.

Dated August 7, 1855.

1784. Caleb Bedells, of Leicester. An improvement in the manufacture of elastic fabrics.

1786. James Alexander Manning, of the Inner Temple, London, esquire. Improvements in the treatment of sewerage.

1788. George Nasmyth, of Kennington, Surrey, civil engineer. Improvements in preserving animal and vegetable matters.

1790. William Mitchell Tileston, of Cannon-street, London. Improvements in machinery for ruling paper. A communication.

Dated August 8, 1855.

1792. Benjamin Williamson Pycock, of Southholme, Gainsborough, Lincoln. Improvements in certain fixtures. A communication.

1794. Nathaniel Smith, of Thrapstone, Northampton, engineer. An improved horse-rake.

1796. Robert Barlow Cooley, of Nottingham, hat-manufacturer. Improvements in the manufacture of hats.

Dated August 9, 1855.

1800. Victor Delperdange, engineer, of Bruxelles, Belgium. A new mode of constructing and joining tubes and pipes.

1802. Phillipe Latour and Maurice Latour, of Paris, France, manufacturers. Certain improvements in looms for weaving.

1804. Peter Armand Lecomte de Fontainemoreau, of South street, London. Improvements in feeding steam-boilers. A communication.

1806. Thomas Sleight, of Mill-street, Hull, York, herbalist and druggist. An improved compound for curing disorders of the bowels, cholera, diarrhœa, and dysentery.

1808. James Robertson, of the Patent Cask Works, Commercial-road, Middlesex, cooper. Improvements in the manufacture of casks and other wooden vessels, and in machinery or apparatus for those purposes.

Dated August 10, 1855.

1810. William Mickle, of Willington, Durham, colliery agent. Improvements in smelting or producing iron from ore in blast furnaces.

1812. George Durham, of Drummond-crescent, Euston-square, and Cornelius Wyatt, of Conduit-street, Regent-street. Improvements in the manufacture of grease for lubricating the axles of railway and other carriages, and the journals of machinery generally.

1814. Edward Finch, of Chepstow. Improvements in machinery for discharging coals, minerals, and other materials from railway, tramway, and other waggons.

1816. Auguste Morin, of Place de l'Hotel de Ville, St. Etienne, France. Improvements in the manufacture of artificial fuel.

1818. Philippe Latour and Maurice Latour, of Paris, France, manufacturers. An improved machine to be used for cutting nails and driving them into the shoe.

1820. George Rose Innes, of Valparaiso, republic of Chili, merchant. Improvements in raising and lowering rolling-blinds. A communication.

Dated August 11, 1855.

1822. Paul Louis Pierre Baragnon, of Rue Duvivier, Paris, France, gentleman. A certain apparatus for preserving and reckoning coin.

1824. Paul Pretsch, of Islington, Middlesex, photographer. Improvements in the application of certain designs obtained on metallic surfaces by photographic and other agency.

1826. Charles Evans Reeves, of Edwards-street, Portman-square, Middlesex, doctor of medicine. Improvements in the construction of repeating fire-arms.

1828. Louis Turletti, of Rue de l'Echiquier, Paris, France, gentleman. A portable alarm-apparatus, for the prevention of robbery by false keys, &c.

1830. Edmund Topham, of Mansfield-road, Nottingham. Apparatus for cleansing out the sediment from the water in steam-boilers, and preventing incrustation of the same.

Dated August 13, 1855.

1832. William John Gregory, of Leeds, York, bedding manufacturer. Improvements in the construction of camp furniture.

1834. William Horsfield, of Langley Mill, Derby. Improvements in the construction of axle-boxes for railway-carriages.

1836. Robert Blackburn, of Wandsworth Paper Mills, Wandsworth, and William Lundi Duncan, of Vale-cottage, Putney-vale. Improvements in bleaching.

1838. Albert Thornton and Frederick Thornton, of Nottingham, mechanical designers. Improvements in the manufacture of elastic or knitted plush or piled fabrics for hats and other purposes.

Dated August 14, 1855.

1840. John Venables, of Burslem, Stafford, china and earthenware manufacturer. Improvements in ornamenting articles made of clay and other similar plastic materials.

1842. George Shears, of East-place, Kennington-road, Surrey, stereoscope manufacturer. An improved construction of stereoscopes.

1844. Louis Marion, of Rue du Grand Prieuré, Paris. An apparatus for consuming smoke.

Dated August 15, 1855.

1846. John Coghlan, of Wexford, Ireland, M.D. An improved method of pivoting artificial teeth.

1848. Samuel Statham, of Cloudesley street, Middlesex, gentleman, and Willoughby Smith, of Hoxton, same county, mechanic. Improvements in electric telegraph cables or cores for the same.

1850. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for manufacturing railroad-chairs. A communication.

1852. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in reins. A communication from Monsieur Sala.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August* 28*th*, 1855.)

838. William Bull. Improvements in bearings, bushes, and other surfaces, in or upon which shafts, axles, or other bodies move or revolve, also

[redacted]

in the said shafts, axles, and other moving or revolving bodies.

845. Edward Ellis Allen. Improvements in steam-engines.

858. John Lawson and Somerville Dear. Improvements in machinery for combing and cleaning flax, tow, wool, and cotton, and other fibrous substances.

863. Thomas Lees. An improvement or improvements in metallic pens.

864. Edward Howes and Walter Howes. Improvements in carriage lamps.

872. François Jacot. An improvement in the manufacture of starch, and in obtaining and treating the gluten.

881. Claude Laurent Victor Maurice. Certain improvements in carbonizing coal, and in apparatus to be employed therein.

882. James Alexander Manning. Improvements in effecting the agitation of fluids and solid matters contained therein.

889. John Drury. Improvements in steam-boilers, for preventing explosion thereof.

892. William Hadfield. Certain improvements in looms for weaving.

895. William Prior Sharp and William Weild. Improvements in the manufacture, and in machinery for the manufacture, of spun or thrown silk threads.

898. William Winter. Certain improvements in the manufacture of warped looped fabrics.

904. Joseph Wright and Edward Brimble. Improvements in the manufacture of stays or corsets, and in the means or method of fastening the same.

909. Henry Jeremiah Iliffe and James Newman. Improvements in the manufacture of covered buttons.

915. Frederic James Utting. Improvements in land-rollers and clod-crushers.

926. John Black. Improvements in axles, shafts, and bearings.

936. Samuel Draper. Improvements in apparatus for retarding and stopping railway-trains.

965. Edward Acres. Improvements in desiccating and cooling atmospheric air, and the application thereof to useful purposes.

969. Henry Francis. Improvements in manufacturing boots and shoes.

997. Jean Pechgris de Frontin. The use of a new material in the manufacture of paper and pasteboard.

1004. Alexander Brandon. Improvements in heating and warming-apparatus.

1024. Charles Claude Étienne Minié. Improvements in muskets or portable fire-arms.

1049. Charles Mertens. Improvements in breaking and scutching flax, hemp, and other fibrous matters, and in the machinery employed therein.

1110. John Knowles and Edward Taylor Bellhouse. Improvements in the manufacture or working of marble, stone, glass, and similar materials.

1121. Charles Claude Étienne Minié. Improvements in breech-loading fire-arms.

1156. Joseph Morgan. An improvement in the manufacture of plaited or platted wicks used in the making of candles.

1183. Alexander Melville. Improvements in breech-loading fire-arms, and in projectiles used therewith.

1185. Joseph Hippolyte Poullain. A new or improved penholder.

1352. Joseph Betteley. An improvement in the manufacture of iron knees for ship-building.

1474. Christopher Jelinger Symons. Certain improvements in steam-engines.

1551. Julius Jeffreys. Improvements in sun-blinds or solar-screens.

1567. Charles Byrne. A preparation of a certain kind of fish, combined with pepper, wine, and other condiments, which preparation may be used for sandwiches.

1577. Robert Yeates. Improvements applicable to the instruments termed "lock" knives and "lever" knives, part of said improvements being applicable also to such surgical and other instruments as may be connected to handles by moving joints.

1604. Adam Burdess. Improvements in the construction of oil feeders for lubricating machinery.

1701. Christopher Thompson. Certain improvements in furnaces with a view to the prevention of smoke.

1702. Thomas Dawson. Improvements in bedsteads, couches, and other like articles of furniture, whereby parts thereof can be made to form a fire-escape when required.

1712. John Whitehead, jun., and Robert Kay Whitehead. Improvements in the manufacture and finishing of textile fabrics.

1739. Joseph Robert. Improvements in machinery for manufacturing fire-arms.

1751. Rudolph Bodmer. Certain improvements in rotatory steam-engines. A communication from Mr. Grainicher, of Natchez, United States of America.

1759. George Henry Fullard. An improved pin for thatch-coverings for stacks and roofs.

1774. John Macintosh. Certain improvements in the application of incendiary materials to be used in warfare.

1792. Benjamin Williamson Pycock. Improvements in curtain-fixtures. A communication.

1824. Paul Pretsch. Improvements in the application of certain designs obtained on metallic surfaces by photographic and other agency.

1838. Albert Thornton and Frederick Thornton. Improvements in the manufacture of elastic or knitted plush or piled fabrics for hats and other purposes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed August 24, 1855.

411. John Haines White.
416. Auguste Edouard Loradoux Bellford.
418. Auguste Edouard Loradoux Bellford.
425. James Brodie.
429. Benjamin Fothergill and William Weild.
432. Thomas Helliwell and Joseph Barker.
433. Alexander Symons.
440. John Gedge.
441. George Mackay Miller and John Wakefield.
454. George Mackay Miller.
488. Arsène Louis Garnier.
493. Auguste Edouard Loradoux Bellford.
545 Auguste Edouard Loradoux Bellford.
606. George Lowry.

670. Alexander William Williamson.
692. Joseph Peabody.
800. Eugène Pasquier.
816. James Templeton.
1132. Samuel Stocker.

Sealed August 28, 1855.

443. Fischer Alexander Wilson.
449. Bewicke Blackburn.
460. George Lowry.
461. Constant Jouffroy Duméry.
466. William George Henry Taunton.
478. Robert Boby and Thomas Cooper Bridgman.
487. Richard Archibald Brooman.
512. Louis Emile Bataille.
517. Alfred Krupp.
553. William Prockter Stanley.
554. William Score.
560. Samuel Swingler.
567. Benjamin Goodfellow.
572. Edward Vincent Gardner.
592. Mark Smith.
600. John Henry Johnson
673. John Shaw, Lewis Harrop, and James Fielding.
767. Anguish Honour Augustus Durant.
831. Peter Armand Lecomte de Fontainemoreau.
1036. Robert Kanzow Bowley.
1222. Richard Coleman.
1274. George Green.
1339. Samuel Coulson.
1374. James Webster.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

Errata.—Last Number (1672), page 185, 2nd column, line 20 from top, and page 192, 1st column, line 14 from bottom, *for* Turray, *read* Imray.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

[redacted]

Mechanics' Magazine.

No. 1674.] **SATURDAY, SEPTEMBER 8, 1855.** **[PRICE 3D.**

Edited by R. A. Brooman, 166, Fleet-street.

PRESTON'S PATENT BAYONETS, ORDNANCE, AND PROJECTILES.

Fig. 7.

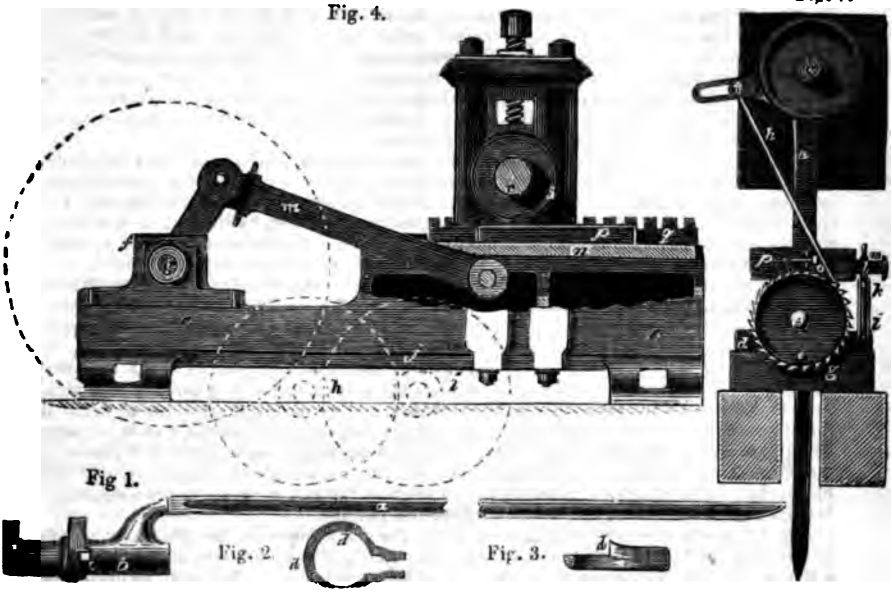


Fig. 4. Fig 1. Fig. 2. Fig. 3.

Fig. 6.

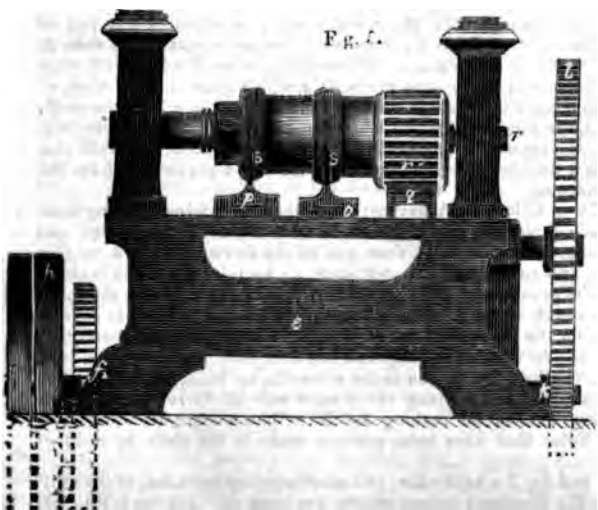
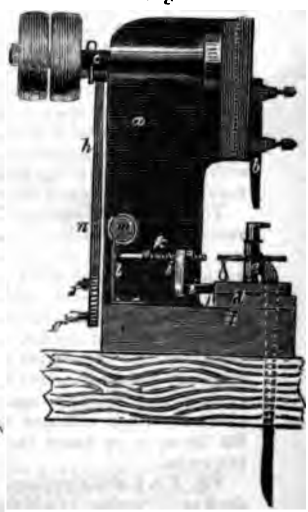


Fig. 5.



PRESTON'S PATENT BAYONETS, ORDNANCE, AND PROJECTILES.

(Patents dated December 30, 1854, and January 12, 1855.)

The following improvements in bayonets, ordnance, and projectiles have been patented by Mr. Francis Preston, of Manchester, who is at present executing several extensive contracts for the Government. (See *Mechanics' Magazine*, No. 1666, page 31.)

The improvements in bayonets consist, first, in making the stop for the lock-ring or motion of bayonets of the same piece as the socket, instead of brazing or screwing the said stop to the said socket, as heretofore; secondly, in making the lock-ring or motion of bayonets of run steel; thirdly, in increasing the thickness of the lock-ring or motion of bayonets at that part where the depth thereof is diminished for the stop: and the improvements in machinery for manufacturing bayonets consist, first, in an improved combination of parts for forming or finishing the flutes in the blade of a bayonet; secondly, in the application of a self-acting stop motion to the slotting machine for cutting the groove in the socket of the bayonet; and, thirdly, in the application of a similar stop motion to the shaping machine for finishing the sockets of bayonets.

Fig. 1 of the accompanying engravings is a bayonet of the usual shape. *a* is the blade; *b*, the socket; and *c*, the stop. It has heretofore been customary to braze or screw the stop into the socket; but as the metal forming the socket is very thin, it is evident that the stop thus attached is liable to be loosened, and eventually to fall out, by the repeated action of the lock-ring or motion. In order to obviate this defect, Mr. Preston proposes to make the stop of one piece with the socket; and for this purpose the socket, when turned, has a shoulder left all round it in a line with the stop; most of this shoulder is cut away by hand or otherwise, but that portion thereof which is required to form the stop is left projecting from the metal of the socket. Fig. 2 is a plan, and fig. 3 a section, of the improved lock-ring or motion, by which the bayonet is held on the muzzle of the musket barrel in the usual manner. On referring to fig. 2, it will be seen that that portion of the lock-ring between the shoulders, *d*, *d*, which come against the stop, *c*, in fig. 1, is increased in thickness, to compensate for the reduction in its depth; by this means the amount of metal in the circumference of the ring is equalised, and the lock-ring is less liable to break when being put on or taken off the socket, than when the lock-ring is constructed in the ordinary manner. These lock-rings or motions have hitherto been made of wrought iron or cast brass; but the inventor now proposes to cast them of the metal known as run steel, which is more elastic than the metals before used for this purpose.

Fig. 4 is a side view, partly in section, of Mr. Preston's improved machinery for making or finishing the flutes in the blades of bayonets, and fig. 5 is an end view of the same. *e* is a strong cast-iron foundation plate, near one end of which are attached the bearings, *f*, for the crank shaft, *g*; this shaft has a slow rotary motion given to it by the driving pulley, *h*, pinion *i* gearing in the wheel, *j*, and pinion *k* gearing into the wheel, *l*, fixed on the crank shaft, or in any other convenient manner. To the crank shaft, *g*, is attached one end of the connecting rod, *m*, the other end of which is connected to the under side of the slide or table, *n*, working in bevel grooves in the plate, *e*. To the table, *n*, are fixed two or other convenient number of blocks, *o*, and dies, *p*, and the rack, *q*, which gears into a pinion, *r'*, fixed on the cross shaft, *r*, supported in bearings bolted to the bed plate, *e*. To the shaft, *r*, are fixed the steel bosses, *s*, the grooves in which are tapered at their sides and convex at the bottom, corresponding to the taper and flute of the bayonet. The dies, *p*, are made also with a taper groove, and with a double convex projection, of the shape required to form the flutes on the outside of the bayonet.

The mode of operation is as follows:—A bayonet which has been forged in any convenient manner with the blade projecting at a right angle from the socket, is heated and laid on one of the dies, *p*; the driving strap is then put on the driving pulley, *h*, to give motion to the crank shaft, *g*, and to the slide, *n*, and shaft, *r*; by this means the blade of the bayonet is pressed into the groove in the die, *p*, thereby forming or finishing the flutes at one half revolution of the crank shaft, *g*. The groove in the boss, *s*, is made to overlap the upper edge of the die, *p*, for the purpose of cutting away any superabundant metal that might extrude beyond the die. As soon as one bayonet has been thus operated upon, it is removed, and another one in the rough is put on to the other die, to be acted upon in the same manner when the crank shaft is performing the second half of its revolution. The above described machine may be used for making the flutes into a triangular blade with flat faces, or to finish the flutes that have been partially made in the blade by hand or otherwise.

Fig. 6 is a side elevation, and fig. 7 a back view, of a small slotting machine, of the ordinary construction, to which Mr. Preston's improvements are applied. *a* is the main casting; *b*, the cutting tool, worked up and down by an eccentric on the shaft, *c*; and *d* is the

[redacted]

slide, from which projects a stud, *e*, to support the socket of the bayonet to be slotted; this slide is moved so as to bring the socket towards the cutting tool, *b*, in the usual manner, by the screw, *f*, ratchet wheel, *g*, and catch, *h*. The improvements consist in the mode of stopping the motion of the slide, *d*, when the slot in the bayonet socket is of the required depth. To the slide, *d*, is fixed a cranked stud, *i*, the upper end of which has a regulating screw, *k*, for acting on the spring, *l*, when the slide has advanced to the required point; this spring enters into a notch in the sliding bar, *m*, fitting in a hole in the casting, *a*; to the bar, *m*, is fixed a projection, *n*, with a set screw, *o*, through it, and this bar is acted upon by the spring, *p*, seen in dotted lines in fig. 7. From the foregoing description it is apparent that when the screw, *k*, pushes the spring, *l*, out of the notch in the bar, *m*, the spring, *p*, pushes the bar, *m*, in the direction of the arrow in fig. 7, sufficiently for the head of the set screw, *o*, to lift the catch, *h*, out of gear with the ratchet wheel, *g*, thereby arresting the further advance of the slide, *d*; the driving strap is then moved by the attendant, from the fast to the loose pulley to stop the machine; the bayonet is then removed from the stud, *e*, and another put on. The handle in the ratchet wheel, *g*, is for the attendant to screw the slide back when a fresh bayonet is put on to be slotted.

Mr. Preston's improvements in the circular shaping machine, by which the exterior of the socket of the bayonet is finished, consist in the application thereto of a stopping apparatus, similar to that above described in reference to figs. 6 and 7.

Mr. Preston's second set of improvements consists, first, in an improved mode of boring cannon and other pieces of ordnance; and, secondly, in an improved mode of constructing projectiles for imparting thereto a rotary motion.

Fig. 8 is a section through a cannon constructed according to these improvements;

Fig. 9.

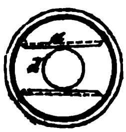
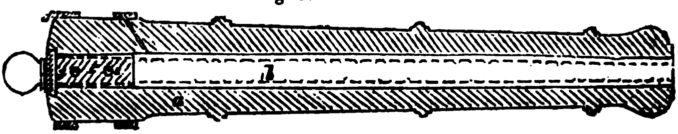


Fig. 8.



and fig. 9 is an end view of the same. *a* is the body of the cannon, which is cast solid in the ordinary manner, or through which a small hole may be cast from end to end. If the cannon is cast solid, he proposes to bore it out first to the size of the hole indicated by the dotted lines *b*, *b*; but if a small hole is cast through the cannon, he then enlarges the said hole to the size indicated by the said dotted lines; through this hole an arbor is passed for supporting the boring-head, by which the hole is enlarged to the requisite size of the bore of the cannon. This arbor and boring head are constructed in the same manner as those employed in boring steam-engine cylinders, or other articles requiring a parallel hole through them; the metal between the end of the enlarged bore and the end of the cannon is then bored out conical, and a plug of a corresponding shape, marked *c*, is driven in to close the breech. In order to prevent the injurious effects of the discharges on the conical plug, *c*, the drift, *d*, is driven into a dovetailed groove in the end of the cannon, to prevent the conical plug being driven further into, and acting as a wedge against the end of the cannon. The plug may also be still further secured by studs or bolts, shown at *e e*, and hoops of wrought iron, such as those marked *f f*, may be shrunk on to strengthen the cannon. Fig. 10 is a section of the breech end of a cannon, representing another mode of securing the conical plug, *c*; in this instance the smaller end of the plug abuts against the end of the tail screw, *g*. Fig. 11 is a side view, fig. 12 a section, and fig. 13 a plan, of one of Mr. Preston's improved projectiles for ordnance. The body of the projectile is of cast iron, and cylindrical, the front portion being rounded off, or nearly hemispherical;

Fig. 11.

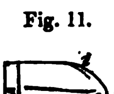


Fig. 10.

Fig. 12.

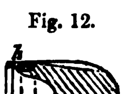


Fig. 13.

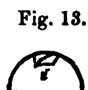
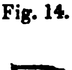


Fig. 14.



the other end of the projectile is recessed, and is furnished with a groove, into which a ring of melted lead, or other suitable metal, marked *h*, is cast; this ring is caused to expand by the action of the exploding powder, in the same manner as the Minié bullet, thereby preventing windage. Along the cylindrical, and partly on the rounded portion of the improved projectiles, three or other suitable number of diagonal or slanting grooves, *i i*,

are cast; these grooves being deepest near the front, and gradually diminishing in depth until they entirely cease, as shown best in the section, fig. 12. The object and effect of these grooves is to impart a rotary motion around its axis to the projectile without making grooves into the barrel of the cannon, the said motion being derived from the resistance of the air acting on the sides of the inclined grooves. Fig. 14 represents an ordinary bullet for a Minié rifle, to which these improvements are applied; in this case the diagonal grooves, *i i*, are produced by pressure, or in any other convenient manner.

NOTÆ MATHEMATICÆ.

(By T. T. Wilkinson, F.R.A.S.; Member of the Manchester Philosophical Society; of the Lancashire and Cheshire Historic Society; etc.)

NO. VIII.

(Continued from vol. lxii., p. 584.)

It is well known that the late Professor Davies paid great attention to geometry, and was never more happy than when engaged in examining its principles or illustrating its applications. At the time of his death he was engaged in preparing a continuation of his papers on "Geometry and Geometers" for the *Philosophical*, and had actually written out a "Note" or two on kindred subjects for the *Mechanics' Magazine*. The last named manuscripts have since been published by James Cockle, Esq., M.A., &c., in the *Philosophical Magazine* for April and July, 1852, and are the more remarkable since they contain a general statement of some of his matured views on the structure and objects of the *Elements of Euclid*, and a few pregnant hints on the fundamental principles of what is usually termed the Greek geometry. Both of the series of papers here alluded to are well worthy the attention of all who are anxious to look into the *philosophy of geometry*; but on the present occasion we would more particularly refer to those "Notes on Geometry" which grace the pages of this Journal, taken in connection with Nos. IX. and X in the *Philosophical Magazine*.

In the former of these papers he replies at length to the objection that the Greek geometry is distinguished by "the total absence of general methods of research, both as regards construction and demonstration;" and after referring to Potts's *Appendix to Euclid*, for a systematic and intelligible analysis of theorems and problems, he passes on in the next paper to notice the "embarrassment to the young mathematician in forming his estimate of the ancient geometry," which arises from "the want of proper discrimination between *classes of propositions* which are in themselves of essentially distinct characters." He observes that "this is traceable to our very elements; for even the first three *Books of* Euclid comprise indiscriminately *almost every kind of* proposition, determinate and indeterminate;" and he regrets "that no single work can be pointed out in which the different classes of geometric research are intelligibly defined."

"The great object of the ancient geometers," he continues, "appears to have been the *solution of problems;* and hence the *investigation of theorems* held no importance in their estimation, further than as they were subsidiary to the demonstration of the constructions arrived at, or in the analyses by which those constructions were obtained. Instead, therefore, of investigating the properties of figures, and classing them according to any rule, good or bad, only those were recorded that became subservient to some step or other in the construction of a problem. This is strikingly manifested in the seventh Book of the *Mathematical Collections* of Pappus, where we see many theorems given as isolated propositions, which form parts of the most beautiful and interesting classes of research that have yet been discovered. That wonderful work by M. Chasles, the *Aperçu Historique*, bears witness to this in almost every page, and it prevents the necessity of adducing illustrative examples in this paper."

In some subsequent remarks, he presumes that the properties of "the *Arbelon*," and some other speculations mentioned by Pappus, may be adduced to "contravene this view of the leading objects of the Greek geometry;" but he sees "no force in such an objection, since Pappus collected his Theorems and Problems "long after the period when geometry could be said to flourish in the school of Plato—long after the decadence of pure geometry amongst the Greeks." The Arbelon, he admits, may furnish a number of properties both "pretty and curious;" but taken *per se* is little more than "mere geometrical trifling." "Nothing of this kind appears to have engaged the attention of geometers during the period of Apollonius and Archimedes; for even the various curves that were devised by the

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ancients were not devised for the purpose of *investigating their properties*, but of *solving some intractable problem* by means of them."

The preceding opinions, however, with respect to the *nature* and *objects* of the Greek geometry must not be received as settled truths. Professor Young, in his instructive "Commentary on the First Book of Euclid," published in Orr's "Circle of the Sciences," appears to hold different views so far as regards the elements. He does not think that "Euclid *liked* problems;" and he adduces as *one* reason, that "there is less careful finish about them than in his theorems." Similar statements might also be collected from the writings of other able geometers; but all of them must yield, in point of critical acumen and breadth of view, to the following masterly exposition from the pen of the Rev. William Thynne, M.A., of the Mall, Tuam, Ireland, which was received by Mr. Cockle shortly after the appearance of No. X., in the *Philosophical Magazine*.

1. "I have received your paper, for which I thank you. I have thought much on the same subject, but have not been in a position to read extensively. As regards the *elements of plane geometry*, I doubt if we agree. The object of all seems to me to be purely *theoretic;* the problems being only subsidiary to the theorems. Of course I except Euclid's *fourth* book, which has, indeed, nothing about it of the air of the others. I think I may add the *fifth* book as another innovation, as also the introduction of the doctrine of *superposition* among the propositions.

2. "I distinguish the elements of the primitive geometry imported by Pythagoras into Magna Grecia from its subsequent depravation to suit the Platonic follies about ideas and about science being all reminiscence. I also suspect that the Pythagorean geometry assumes the doctrine of atoms; but I do not say that that foundation was early abandoned, and geometry constructed without any assumption on this head either way. As I take the case to have been, the Pythagorean geometry was constructed on a scrupulous logical system, and mainly with a view to logical praxis.

3. "Let us take the first three propositions of Euclid. They are problems; but they are required in a batch of theorems following. Then no more theorems can be given without premising more problems in the same way; and so on to the end. Why premise these problems when we may *conceive* all *to be* that they show us could be made *to be?* Because we cannot assume the possibility of a thing merely because we conceive it. I may know there are equilateral triangles—store of them—but I cannot assume that one is capable of standing on every line, nor therefore on the particular line before me. The same thing holds of a square; and it is necessary before I assume that any line can have a square on it, to prove in some way that it is *naturally* possible to make a square on it, if there be none already. This view of the *elements* simplifies its structure, and relieves it from the charge of being a jumble. Had the author's object been to teach *practical* geometry, the problems should be expected to adapt themselves to *practice* rather than to *theory*—as in geometrical trigonometry we see done.

4. "The structure of the demonstrations is also primitive. We hear a deal about 'general arguments' or 'arguments in general terms;' but there is nothing of that spirit in the ancient geometry. A sample—or what is allowed to be a sufficient sample—of the thing about which we are to reason is exhibited to us; and on that sample we do reason, so far as regards the conditions proposed to us, and we infer it as true that the statement of the proposition holds for that single sample. Then there is a tacit supplement common to all the demonstrations that since the argument did not go beyond the conditions, so as to be affected by any of the *specialities* of the sample, the same argument would hold of every sample. Thus the proposition is universalized.

5. "In this way all the demonstrations proceed; and if this common supplement were originally stated, or stated once for all, or given in this logical system; in any case it did not please the Platonists, and they would huddle it out of view, though they could not do without the argument, nor the argument without it. To the present hour, I doubt if there are many geometers who see the full argument—at least fully—for all have an obscure impression of it. But in the case of slow, dull, but sensible learners, it is necessary to state it, and it takes away almost all their difficulty to do so. It is the usual process of generalizing from *singulars known*, and then particularizing to similar *singulars unknown*. If the exhibition of some drug is followed by relief from some ailment in a single instance, it raises a supposition that it is a specific; and this grows into a confidence after several instances of the same kind, and we rely on that specific for every future case. A single instance were sufficient, not only for assurance, but for demonstration, could we but know the specific action of the drug; and that so far as regards it, all persons labouring under that complaint are alike.

6. "It is in the axioms that I consider the Platonic geometry to corrupt the Pythagorean most. What are axioms or principia? As we have them in Euclid they are a miserable jumble without any cha-

racter. I have no doubt that the postulates and axioms were, as I may say, *præ-geometric* problems and theorems. To describe a circle, and to describe an equilateral triangle, are like one to the other. But if my opponent says that he will deny it to be possible, as things naturally are, that a circle could exist with that particular radius, I have no resource but to close the discussion. I therefore require this concession from the first; whereas I am independent of his concession in regard of the triangle—that is of any *direct* concession. He may also silence me if he denies that a right line may exist having two proposed points for its extremities;—for he may say every *real* line is composed of atoms, and however small they may be, I do not know that a range of them shall extend from the one point to the other without overstepping somewhat one of these limits. Neither can I produce a line indefinitely, lest he should say that all *natural* things are, as far as he knows, *limited*, and he does not see that any actual line can naturally pass its own limit, whatever that may be. As to *supernatural* lines and ideal phantasmagoriæ, they may talk who know anything about them;—but he does not.

7. "Now take into consideration that the plane elements never pass from plane to plane; or seem to suppose that there is any *second* plane in the whole world—review the very second proposition. This has mark of design, and I suspect—more than suspect—that the primitive system conditioned that the plane should be of uniform atomic structure. This shuts out those objections. From any atom to any other atom there must be a coherent range of like atoms—that is a line. To continue a line indefinitely does not mean infinitely, but limitedly; and a proposition requiring for its argument such a production, must grant a plane sufficient for it. Otherwise there should be, above all things, a postulate for the extension of planes as well as lines. What I have said of the uniform plane might have been given as a postulate;—but perhaps it is too much of a condition, and too little of a problem, to marshal it with those we have.

8. "Come we now to the axioms. People say that axioms are 'self-evident truths;' which I take to be a mistake on a mistake. Thinking that Euclid's axioms are mostly of this character, they suppose that the ancient word must have some such meaning—technically, at least. 'Things that are equal to the same are equal to each other;' this is thought to be as plain as that two and two make four. If so, why does not Euclid make an axiom of this too? In truth, the first axiom, so far from being plain, is very perplexing. For what means '*equal?*' The common use of the word, you may say, makes its sense plain enough. For *common use* it does: and when things are said to be equal, we readily understand that they are so in some respect, expressed or implied, though they may be unequal in every other. If you say that this triangle is equal to that triangle, or to that square, I require to know in what respect—unless when I begin geometry I must give up common sense. Perhaps you will say, that as nothing else is in evidence but quantity, my common sense should tell me that they are meant to be equal in quantity. What say you of angles? They are no quantities, but only relations. Do they come under the axiom? Perhaps the Pythagoreans, or the Egyptians, or the Chaldeans, or the Indians, or whoever were the primitive geometers, did make the blunder of reckoning angles as true quantities. I doubt that. In any case the axiom loses some of its self-evidence. Well, throw angles out of evidence—that is as angles—and not as subtending arcs—and come to true quantities.

9. "You say two lines are equal. How? In the distance, you say, between their respective extremes. *Distance* is no quantity, though it may be measured by one; but it is itself a relation. The lines then are equal in regard of *a relation*. My common sense does not make it self-evident that things equal *in respect of a relation* to a third are equal to one another—at least as a general enunciation. But the atomist settles it easily. The lines are equal, because they consist of equal atoms in equal numbers; that is, they are equal in the *number* of atoms. But my objector does not admit atoms, he is an *infinitely-divisible* man. Then let us not quarrel about it; I will not assume atoms here for my own satisfaction, if he allow the general truth in his own sense, or in some sense, for I question if he has any of his own; for how is that self-evident whose meaning cannot be fixed? I may ask, how do you say that this triangle is equal to that square? I know what I understand by it, and I have no doubt, that if you scrutinise your own thoughts, you will find that they glance the same way; but you are too fast a man for that. These Pythagoreans were a saucy combative set!

10. "But the foundation of the comparison of figures as to area is the axiom of superposition. 'Magnitudes that coincide are equal.' Here the atomist is quite at home. They are equal, because every point has another point over against it: both then have the same number of points. What say you? *Magnitudes that coincide are equal in magnitude!* The fourth proposition of Euclid's first book is but a case of this, and

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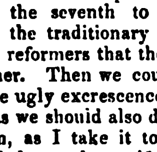
should be an axiom too. So far we relieve the elements of making demonstration by superposition. An argument condemned by it, in that it never resorts to it when it so often may—and, if *it* were *demonstration*, should. The only other instances of it are to get to the eighth proposition of this book, and again once in the third book. The last is easily disposed of if we can relieve the demonstrative course of the eighth by reckoning it too among the axioms, as a truth of which we may be assured by a satisfactory argument resting on trial and appealing to common experience. As the fourth proposition depends on the axiom that right lines do not enclose space; that is, do not intersect more than *once*, so the eighth rests on this, that circles do not intersect more than *twice*—a principle just as admissible. I may challenge the adversary alike to make circles intersect more than twice, and right lines more than once. Here, then, I have the seventh proposition, and from it deduce the eighth by the argument of a conceivable superposition. Of course an idealist will none of this. *Sense* with him is all delusion, and *common* sense the worst. He manufactures the axioms into that clumsy thing, the seventh proposition, no where else to be employed.

11. "Had not this been the framework of the primitive system, and the eighth rested on the seventh in some such way, we should expect to have it proved by *juxtaposition*, and the seventh to be entirely omitted; but the traditionary proof would so engage the reformers that they would not look for another. Then we could also dispense with the ugly excrescence of the fifth proposition, as we should also do in the primitive system, as I take it to have been. By the way, I do not know if any one has thought of proving the fifth proposition, *without any construction;* thus:—A B C being an isosceles triangle, and C its vertical



angle; instead of having triangles partially overlapping, as in the bridge, taking them totally overlapping; the triangles $a\,b\,c$ and $b\,a\,c$ have the angle C common, and a, b, respectively equal to b, a, and therefore $\angle A = \angle B$, and also $\angle B = \angle A$.

12. "The equality of right angles is a like lesson of experience. Of the twelfth axiom I say nothing here, because I should say much; but of the axiom that 'the whole exceeds the part,' I say nothing, because I do not know what to say, or how to account for its intrusion. Whether we rightly understand it, deserves consideration.

13. "I have intruded on you to a greater length than I had any intention of doing. I thought I should be able, in a much smaller space, to indicate the logical structure, as I take it to have been, of the primitive elements; and for this it was necessary to discuss somewhat the department of axioms as preliminary to its demonstrations—as the doctrines of refraction and reflection to optics—of the composition and resolution of forces to mechanics, and all such generalized experiences of which we are so well satisfied as to rear the sciences on them; as the architect confidently erects some vast and noble pile on a well-explored foundation, leaving to those whom it amuses to build palaces in the air.

14. "But it has not been my purpose to contend for the hypothesis of the monads here, but for the mere logical framework of the primitive geometry. The Greeks were an æsthetic rather than a scientific race; they could admire the style of Herodotus, without appreciating his research. They added grace to the inventions of others, and then claimed to be the inventors themselves. We talk of the Greek geometry, and think because we got it *through* them, we got it *from* them. Possibly it did receive some improvements in Magna Grecia; but I doubt even that, and reject all that foolish writers tell us of it. Of all things, I reject the *derivation* they give of the name. I have no doubt this comes from γῆ as an *element*, and not as *land*. Their chemistry, if we may call it so, reckoned four elements—fire, air, earth, and water. The first we may, or rather *must* receive, as comprising the principles of light and heat; the second what we may call gaseous fluids, or what would seem to them to involve the principle of repulsiveness; earth as comprising things cohesive, and water as including matter incohesive. Geometry would then imply the dimensiveness (to coin a word) of cohesive things, in fact, of solids.

"The Mall, Tuam, Ireland, Oct. 5, 1852."

The length of the preceding communication precludes the possibility of offering any remarks on its contents on this occasion. In the next we shall embody some of the latest conclusions to which Professor Davies was led, by a careful examination of the same subject, and in the mean time would solicit the opinions of any of the talented correspondents to this Journal, on the many points mooted in the preceding admirable letter.

(*To be continued.*)

TRIALS OF REAPING MACHINES.

In No. 1670 we announced that an adjourned trial of reaping machines exhibited at the Paris Exhibition would take place on the 14th ult., when Burgess and Key's reaper would be tried with the others mentioned in our report. This reaper was manufactured for the patentees by Samuelson, of Banbury, and owing to its having been badly made, it broke down, and the triumph was again reserved for the veteran prize machine of M'Cormick, which distanced all competitors, as on the previous occasion, and will, no doubt, have the gold medal awarded to it.

The reapers exhibited at Carlisle to compete for the prize given by the Royal Agricultural Society were tried, in pursuance of an arrangement entered into at Carlisle, at Abbot's Leigh, near Bristol. We quote from the *Gardeners' Chronicle* the following report, from which it will be seen, that our anticipations of the value of the M'Cormick reaper with Burgess' self-delivery, have been fully realized. We are gratified to learn that such eminent manufacturers as those mentioned in the report have undertaken to manufacture the reapers. Messrs. Burgess and Key need fear no more breaks-down from inefficient workmanship.

"ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

The deferred trial of the Reaping-machines selected at the Carlisle Meeting took place at Abbot's Leigh, near Bristol, on Wednesday, the 29th of August, in the presence of Mr. Miles, M.P. (President of the Royal Agricultural Society of England at the Carlisle Meeting), Sir Stafford Henry Northcote, Bart., M.P. (Steward of Cattle at Lincoln), Sir Archibald Keppel Macdonald, Bart. (Steward Elect of Implements at Lincoln), Mr. Dyke Acland (one of the Editors of the Journal), Mr. Raymond Barker (Vice-President and Chairman of Finance), Mr. Brandreth Gibbs (Honorary Director of the Show), Mr. Granger (Judge of Field Implements), Mr. Hamond (Steward of Implements at Exeter, Lewes, Gloucester, and Lincoln), Mr. Fisher Hobbs (Steward of Implements at Lewes, Gloucester, Lincoln, and Carlisle), Mr. Hudson (Secretary of the Society), Mr. Huskinson (Judge of Field Implements), and Mr. Clare Sewell Read (Judge of Field Implements); including, among the exhibitors, Mr. Burgess, Mr. Alfred Crosskill, Mr. Dray, Mr. Key, Mr. Peter Love, Mr. Mackenzie, Mr. Palmer, and Mr. Suttie; and among the general company, Sir John Key, Bart., Captain Gordon, Mr. Philip Miles, Mr. Knatchbull, Mr. Pitman, and Mr. George Pope.

Mr. Miles having directed every arrangement to be made for the supply of his own horses to work the machines, and for the order in which successive crops of wheat and barley, under the most favourable as well as under the most unfavourable circumstances for reaping, were to be cut, the competing machines were set to work simultaneously, under the orders of Mr. Fisher Hobbs, and the inspection and critical examination of the judges. No pains were spared by every one engaged to render the trial in every respect perfect and satisfactory. This result was finally attained, and it is probable that no reaping-machines in this or any other country have ever been more severely, impartially, or satisfactorily tested than in the trial at Abbot's Leigh.

I. Prizes offered.—For the best reaping-machine, £30; for the second-best ditto, £20.

Special Condition.—In adjudicating on the reaping-machines, the attention of the judges will be particularly called to the best mode of delivery.

II. Judges' Awards:—

"Leigh-court, Aug. 29, 1855.

"We award the 1st prize of £30, for the best reaping machine, to Stand 61, Article 1, Messrs. Burgess and Key, for M'Cormick's reaper improved by themselves.—The 2nd prize of £20, for the second-best ditto, to Stand 79, Article No. 3, Mr. John Palmer, of Stockton-on-Tees, for Forbush's reaper improved by the exhibitor. We highly commend Stand No. 34, Article No. 3, Messrs. Dray and Co., for Hussey's reaper improved by themselves.

"T. W. Granger.
"Thomas Huskinson.
"Clare Sewell Read."

III. Exhibitors' Catalogue Specifications.

Stand No. 68, Burgess and Key, of 103, Newgate-street, London. Article No. 1 (New Implement).—A reaping machine; invented by Cyrus Hall M'Cormick, of Chicago, United States of America, improved and manufactured by the exhibitors. It received the Council Medal at the Great Exhibition in 1851; the Prize Medal at the Yorkshire Show in 1852, the award of the Driffield Farmers' Club; first prize of the Durham County Meeting at Sunderland; and the award of the jury appointed at the nine days' trials of reapers at the Royal Agricultural College at Cirencester, and after the test of four years it is found to be a machine which will cut under any circumstances when desirable. It is so constructed, and of such materials, that it is not liable to get out of repair, and is easy draught for two horses, and when required can be repaired by any carpenter and blacksmith on a farm, without sending it to the manufacturer. The only objection to this reaper

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was, owing to the fact that our crops being much heavier than those grown in America (where some thousands of these machines have been in work for the last fourteen years), it is found in some cases to be very hard work for the man to rake the cut crop off the machine; and this objection we believe we have completely overcome by means of our patent Archimedean screw platform, which, without adding to the draught, delivers the cut crop off the side of the machine in a perfect swathe. The only labour, therefore, now required to work this machine for a day on level land is two horses and a lad of about fifteen to drive; on hilly land the draught is, of course, more, and a change of horses would be required. Price thirty-five guineas.

Stand No. 79. John Palmer, of Stockton-on-Tees, Durham. Article No. 3.—(New implement.)-A combined reaping and mowing machine; invented by Forbush, of Buffalo, United States; improved by the exhibitor; and manufactured by Forbush and Co., and the exhibiter. This machine is especially adapted for small occupations, and it is also suitable for large occupiers, when it is thought desirable to deliver the corn in sheaves. The driving works of the machine are so arranged as to prevent a side-draught or a tendency in the machine to run into the uncut corn. There is no pressure upon the horses, the machine being evenly balanced. The knife cuts from the centre of the driving-wheel, hence the stubble is left the same length on the ridge as in the furrow. From the peculiar construction of the guards, and the pierced, or skeleton knife, the tendency to choke is completely overcome. By the application of Palmer's roller platform, the heaviest and longest crops are delivered with ease. By using the radiating roller platform, barley, oats, and short wheat are delivered at the side, out of the track of the horses. Price, with back platform, £25; with radiating platform, £5 extra.

Stand No. 34. William Dray and Co., of Swan-lane, Upper Thames-street, London. Article No. 3.—A patent reaping machine; invented by Obed Hussey of the United States, improved and manufactured by the exhibiters. This machine has considerable advantages over that known as "Hussey's Reaper," and received the prize of the Royal Agricultural Society at Lincoln, 1854, in addition to those of the Bath and West of England, the Stirling, the Burnley, and North Lancashire, all in 1854; thus gaining every prize for which it competed. Its great advantages consist in its having a tilting-platform, which enables the attendant to deliver the grain with the greatest ease; a patent skeleton knife, instead of the solid blade in the original, which effectually prevents choking; has a leverage for raising and lowering the cut, and a wheel to relieve the horses of the weight of the machine. Price £25.

Thus has concluded a trial which will be memorable in its immediate effects, and in the future results to which it will doubtless lead. The report of the stewards and judges, in reference to its details, along with the report of Mr. Fairbairn (communicated to Mr. Miles), on the trial of reaping-machines at Paris, will appear in the next part of the Journal of the Society. In the meantime, Messrs. Garrett and Son, of Saxmundham, and Messrs. Ransomes and Sims, of Ipswich, have entered into arrangements to manufacture for Messrs. Burgess and Key the reaping-machine which has gained the first prize at Abbot's Leigh.

The splendid character of the weather, the beauty of the scenery, and the truly English hospitality displayed at Leigh Court; the excellence of the trial, and the satisfaction and generous rivalry only of the competing exhibitors, were all of them gratifying circumstances, which appropriately terminated Mr. Miles's presidency of the Royal Agricultural Society of England, in the same spirit and with the same decided effect as had marked its progress in every transaction from the commencement."

THE PROJECTILE CONTROVERSY.

To the Editor of the Mechanics' Magazine.

SIR,—May I crave permission to say a few words in your valuable Journal, on the projectile controversy, as it is called?

However much I differ from Mr. Evan Hopkins and his disciples, and however much I may conceive them to misunderstand the general teaching of mathematicians, I respect their sincerity and earnestness of purpose; and my object shall be rather to convince them of their errors than to endeavour to hold them up to the ridicule of your readers.

To begin with Mr. Evan Hopkins. I do not think it necessary to say much with respect to the quotation from Herschel's "Astronomy," for the object of that great philosopher in the passage in question is, undoubtedly, not to propound a theory of projectiles "intended to be of service," which would have been quite foreign from his whole design; but to enable his readers to comprehend, by help of an illustration easily understood, how planets may describe round the sun symmetrical re-entering orbits, by the action of a force tending to the sun as a centre.

Now, as there is no reason to believe that the space in which planets move is filled with a sensibly resisting medium, it would have only introduced a useless complication to take into consideration the resistance of the air to the *illustrating* projectile. And I may here so far anticipate what I have to say in answer to "Civil Engineer" as to remark, that in speaking of the parabolic theory of projectiles, as held in high veneration by mathematicians, he betrays an entire ignorance of what mathematicians do really hold on that subject. If he will point out any one mathematical philosopher who maintains that a body projected from the earth's surface, subjected to the action of atmospheric resistance as well as the earth's attraction, will describe a parabola, I will allow that he has some colour for his statement; but the truth is widely different: the path which a *projectile would describe in vacuo* (and if "Civil Engineer" consults any sound elementary work, he will find the problem propounded in these or similar terms) is most properly and usefully placed before a beginner, as the *most simple* exercise in the application of the general laws of motion in which he has been instructed; when the motion of the body is oblique to the direction of the force. The study of this case for *the purpose of instruction* is invaluable; and I am sure that the interests of the learner would be seriously sacrificed, were it omitted from our elementary works, because it does not (as it does not *profess* to do) comprehend the actual circumstances of a body projected, *not in vacuo*, but at the earth's surface. I will now remark on the main point in the issue raised by Mr. Hopkins. He says: "An arc of equal angles at each extremity is made on the *supposition* that a projectile has a *uniform* motion, and not a decrescent one (see the parallelogram)." How can a *projecting* force produce a *uniform motion?*

I can hardly conceive how any one who professes to state what the teaching of mathematicians on this point is, can make so grave an error as appears in this statement. It is no part of the received doctrine of projectiles that *equal spaces* are described in equal times, or that the motion is *uniform*.

I have been at a loss to imagine where Mr. Hopkins and his follower, "Civil Engineer," have picked up this strange notion. The only supposition on which I can account for it is, that they have made a false application of the principle known as one of Kepler's laws, and explained by Newton; viz., that in the case of bodies moving round a fixed centre of force, the areas swept out by the lines joining the moving body and the fixed centre are proportioned to the *times in which they* are described. The space itself, described by the moving body and represented by the arc of the curvilinear orbit performed in that time is by no means proportional to the time, but varies according to the situation of the body in its orbit.

In the case of a projectile in vacuo, the force (gravity) acting in parallel lines, tends to a centre removed to an infinite distance; and the equable description of areas by the lines drawn to the centre of force, though true, admits of no mathematical representation. The actual space described, however—that is, the arc of the parabolic path—is not proportional to the time in which it is described; that is, equal spaces are not described in equal times.

If this were the case we should have, if s were the space described in time t,

$$\frac{s}{t} = \text{a constant} = c \text{ suppose}$$

$$\text{and } \frac{ds}{dt} = c;$$

but on the mathematical theory of a projectile in vacuo,

$$\frac{ds}{dt} = \sqrt{u^2 - 2\,gu \sin \alpha\, t + g^2 t^2},*$$

which is a very different expression, and by no means consistent with the notion that equal spaces are described in equal times.

The last sentence in the paragraph which I have quoted from Mr. Hopkins' letter requires, perhaps, one word of comment. How can a *projecting* force produce a *uniform* motion?

What does Mr. Hopkins understand by a projecting force? Does he suppose that the *projecting* force has any action on the body after it has ceased to be under its influence? "Mathematicians" (as he terms them, as it would appear in invidious contrast to *philosophers*) *suppose* that while a stone that is to be projected is in the hand of the thrower, and while a cannon-ball is actually in the cannon, and before it leaves its mouth, the muscular exertion and motion of the hand in one case, and the explosive force of the gunpowder in the other, beget a motion in the projectile, imparting to it a velocity increasing from zero to that with which it finally leaves the hand or the cannon's mouth. The *projecting force* produced by the hand in one case, and the explosion of the gunpowder in the other, does not, therefore, according to their notions, produce a *uniform motion*. In fact, according to the received laws of motion, so long as a force continues to act on a body, its motion *cannot be* uniform. But then mathematicians *sup-*

* Where u is the velocity of projection; α the direction; g the force of gravity, and t the time it has been in motion.

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pose that when the stone has parted company with the hand, and the cannon-ball has cleared the cannon's mouth, the muscular and the explosive action have ceased to act on the body, and the *projecting force* has done its duty.

Will Mr. Hopkins maintain that, by some secret invisible agency, the stone and cannon-ball are still subject to the influence of their projecting forces after they have left the regions in which they are subject to their direct material influence? Now the problem we have to solve is, What becomes of the body *after* it has been so projected? Mathematicians, therefore, concern themselves with these projecting forces only as the instruments used for the generation of a certain velocity with which the bodies are *supposed* to be projected; and when they have left the regions in which these forces act, their *subsequent* motion is *supposed* to depend on them only so far as they have served to produce this velocity. The subsequent *modifications* of motion will be due to the action of the earth's attraction and the resistance of the air.

Now the *first law of motion* informs us that a body in motion (no matter *how* that motion is produced), *acted on by no external force*, will move *uniformly* in a straight line, and therefore will describe equal spaces in equal times.

The *second law* tells us that if an external force act on a body already in motion, it will produce an alteration in the body's motion; and that the change will be in the direction of the force, and proportional to its magnitude.

These two laws are not the mere *suppositions* of mathematicians; they have exercised the profoundest intellects the world has ever produced; they have been rendered *highly probable* (almost, if we may so speak, *demonstrated*) by experiments: but they depend chiefly for their evidence on this fact; that the most intricate cases of motion which analysis will reach, the *full circumstances* of which are known, when calculated by their aid, have been found to agree most accurately with the facts which *observation* puts us in possession of. And "Mechanic" is quite right in instancing here the discovery of Neptune by means of Mr. Adams's and M. Leverrier's calculations. All their *suppositions* consisted in these three, viz., that the first and second laws of motion are true, and that every body in nature attracts every other body with a force proportional directly to its mass; that is, the quantity of matter in it, and inversely as the square of its distance from the attracted body. It is not too much to say, that if any of these three laws were untrue, the appearance of the planet Neptune at the time and in the place indicated by those philosophers, by the solution of a most intricate and difficult problem depending solely on those laws, would have presented an instance of wonderful coincidence beyond any which the world has ever seen.

I may, also, here remark, that the theory of work, the theory of the fly-wheel, the calculations upon which the dimensions of that important reservoir of work are determined; all the calculations in general use among engineers of all classes, are based upon the *supposition* of the truth of these two laws of motions. It would be tedious and unnecessary to show the truth of this statement in every instance. If, therefore, Mr. Hopkins and his followers deny their truth (and I have shown that what they do deny depends strictly on these laws) they must be prepared with other principles of as universal application, and with as great an amount of evidence in their favour as these which they discard.

I may here remark, that Mr. Hopkins and his school represent mathematicians (as distinguished from themselves—practical engineers, I presume, and philosophers of this class, because, if the truth were known, they possess greater resources in geometry and analysis) as inventing or supposing (as they term it) laws of nature, just by way of amusement, or to make the solution of the problems presented to them easier—just as a novel-writer invents the plot of his story. Nothing can be more abhorrent from the truth than such a representation. Mathematical philosophers are the last men in the world to propound rash theories having no foundation in truth. The ordeal through which any new theory has to pass—not from the *practical* school of engineering philosophers—but from the keenest intellects in the civilized world armed with all the resources of mathematical research, is quite sufficient to daunt any one who pretends to the name of a mathematical philosopher, from publishing rash unsupported theories.

The history of all those *theories* which are now universally received as true in the philosophical world, attest the truth of what I have advanced.

The Newtonian doctrines, which Messrs. Hopkins and Co. seem inclined to assail, had to undergo the ordeal of the prejudiced criticism of several successive generations of mathematicians, before the evidence on which they rest was found to be so unassailable, as to entitle them to that general homage which they now receive. I repeat it therefore, without fear of contradiction from those who have studied the history of mathematical inquiry, that no class of men are so little inclined to base a theory on gratuitous *suppositions* as real mathematicians.

The remarks of "Civil Engineer," require

little comment. They are all based on the absurd idea that he imputes to mathematicians, that a projectile describes equal spaces in equal times.

He evidently thinks he is propounding something new in the *experiments* he desires "Mechanic" to make. I am very much mistaken as to "Mechanic's" attainments as evidenced by his letters, if I am not justified in saying that he was familiar with all these facts and experiments long before they entered into "Civil Engineer's" philosophy. But they prove nothing whatever of what "Civil Engineer" infers from them.

If that gentleman would refer to one of those sources from which he derives his ideas of the profound respect in which mathematicians regard the parabolic theory of projectiles, in other words, the elementary treatises on mechanics, he will find formula for calculating the height to which a body projected vertically, in vacuo, will rise; and in more advanced works he will find the same problem solved, taking into account the resistance of the air; so that, I fear, mathematicians will not be so grateful as they ought to be, for the suggestion of these experiments, which are to them as old as the hills.

I cannot conclude this letter without an observation on the confused sense in which the term theory is used by our new school of *practical* philosophers. Mr. Hopkins, in his letter in your August Number, tells us, evidently in depreciation of received philosophical laws: "Mathematical forms of calculation have been preserved, from time immemorial, to calculate the periods of eclipses, &c., whilst the physical hypotheses of the movements of the heavenly bodies have been many times changed in the interim. The present lunar theory was principally founded on the observations of Bradley and Maskelyne, but is still very unsatisfactory. Many of the existing theories will not stand the test of observation." And he then goes on to tell us what Whewell has said of the difficulty of comprehending the physical theory of the moon.

The ancient calculations, here instanced, have nothing whatever in common with physical theories. *Observation* puts us in possession of certain facts regarding the heavenly bodies. The mathematician expresses these facts in the terms of his art, and pursues them, by help of his mathematical resources, to their legitimate consequences. Hence arise calculations of the kind in question, and the whole of that extensive field of inquiry comprehended under the term of *plane*, as opposed to *physical* astronomy. No theory, in the strict sense of the term, is involved here. If the observations are *correct, and the mathematical* deductions from them are correctly made, the results of the investigations are true, *whatever theory* of the motion of the heavenly bodies be adopted to account for them.

So with regard to the lunar theory. The only physical *theory* on which the moon's motion is accounted for is that of the truth of the two laws of motion stated above, and of the universal gravitation of matter according to the law I have also stated. The problem is no doubt one of the difficulties, and its solution leads us to expressions of a complicated nature. Now in one sense, and no doubt that in which Whewell uses the term, the *physical theory* of the moon implies the geometrical interpretation and clear conception of the several terms of the expressions thus presented to us; and no doubt the theory of the moon, in this sense, is difficult of comprehension, and requires for the purpose considerable mathematical attainments and powers of conception. But, the original physical theory from which, by a strict mathematical process, the results in question flow, is not, as I have shown, in any great degree difficult of comprehension. Bradley and Maskelyne had no more to do with the lunar theory, than as they supplied by observation the constant data which enter into our mathematical expressions.

Again, when the lunar theory is said to be unsatisfactory, be it remembered that astronomers are not satisfied if there be an error of even a few seconds between the observed and calculated places of the moon. An error amounting to minutes would horrify them. A slight error in some of the constants deduced from observation, or the neglect of taking into account a few more terms in the expression for the moon's longitude, would amply account for all the discrepancies which have appeared between theory and observation; but no astronomer doubts for a moment that Newton's theory gives a correct account of the case. As regards the actual problem of a body projected at the earth's surface—"Civil Engineer's" dictum, "we can easily determine the resistance of the air and water; *they are constant quantities;*"—no one but himself has been rash enough to hazard: and I confidently believe, that not even his patron, Mr. Hopkins, will adopt it.

The discovery of the exact law and amount of resistance of a fluid medium has long exercised the keenest intellects, and is confessedly yet a desideratum. An approximately true law, viz., that resistance varies as the square of the velocity, has been adopted for want of a better; but it is confessedly only an approximation; and if Mr. Hopkins and "Civil Engineer" would do good service, let them apply their philosophical talents to the discovery of the true law; or,

at all events, if they have leisure, institute (if they can) more accurate experiments, than have hitherto been made in this important branch of physical science.

I do not enter on the question of "attempting to make rectilinear and curvilinear figures equivalent by reduction, and cutting off corners," by which, I suppose, we are to understand, bringing this class of questions within the range of the doctrine of limits. The inference to be drawn from Mr. Hopkins's and his followers' letters, is, that they cannot comprehend what a limit is. To form a conception of this sort, undoubtedly requires a certain power of mind, and, after all, falls more within the province of metaphysics than of mathematics.

A learned lecturer at one of our universities, whose duties required him to teach Newton's "Principia," the first book of which includes his exposition of the doctrine of limits, is reported to have been in the habit of saying, at the conclusion of this portion of his course, "This, gentlemen, is what Sir Isaac Newton teaches on limits; for my part, show me a limit, and I will believe that there can be such a thing!" Minds of this class can no more comprehend a metaphysical subtlety of this kind, than a blind man can form a notion of black and red. We must be content, therefore, to leave them in their state of blindness; they must not, however, be offended if our opinion of the value of their philosophical lucubrations receive some complexion from their acknowledged inability to comprehend the doctrine of limits, without which no amount of *parallelograms* will suffice to solve correctly any problem in which a variable force enters as an element in the calculation.

This letter has run on to a much greater length than I originally intended; and I must therefore conclude, although the subject is far from being exhausted.

I am, Sir, yours, &c.,

W.

THE SCIENCE OF PEACE AND OF WAR.

To the Editor of the Mechanics' Magazine.

SIR,—"Another Reader," at page 207 of your last Number, quotes the words of a former correspondent to the effect that, France and England "are *unable* to cast even a tithe of the scientific skill which they possess, into their war treasuries." That they are *unable* so to do, is by no means apparent; that they have hitherto been unwilling, is another matter. That nations, who for nearly forty years, have devoted themselves most sedulously to the promotion of arts of peace, should for a time be placed at a disadvantage, when opposed to an adversary, who, for a like period, has been most energetically prosecuting arts, and preparing material, of war—need excite but little surprise. But that, when occasion requires, both countries are *able* and *willing* to direct their skill and energies to warlike pursuits, is evidenced by the activity in the Government works, and in the manufactories heretofore exclusively devoted to the arts of peace, being now actively engaged in making the most skilful preparations for war. It is unfortunately true, and matter of deep regret, that many important improvements in the *materiel* of war, have been shelved by those who ought to have given them encouragement. Some of these have been proved to possess great merit, and to afford important advantages: others, however, have not been reduced to practice so as to confirm or disprove the good quality claimed for them by their sanguine inventors. In the Exhibition of 1851, many beautiful inventions and improvements in gunnery met the eye of the visitor; of these, how many are available at the present crisis? Take, for instance, Messrs. Ferguson's improved gun carriages * (for ships) which were tested with most excellent results on board the *Excellent* gunnery ship, at Portsmouth, *and adopted in all the new Spanish steam frigates;* of these, how many are there in our superb fleets? Few persons have the most remote idea of the discouraging treatment which such inventors have hitherto received at the hands of the Ordnance authorities, who have been fenced round with an impervious palisade of official routine and etiquette, more impenetrable than the earthworks of Sebastopol.

While men of science, in England, have been subjected to all the "insolence of office which patient merit of the unworthy takes," our arch adversary was pressing into the military department of his service all the talents he could gather. The late General Reed, who fell ingloriously in the conflict of the Tchernaya, was the son of Mr. William Reed, civil engineer, of Montrose, who in early life entered the service of the late Emperor Alexander, and settled in Russia, where his son was born. Some of your "oldest readers" may, perhaps, remember the interesting papers which, upwards of twenty years ago, Mr. W. Reed contributed to the pages of the *Mechanics' Magazine* descriptive of inventions which he had perfected, and works established by him at Peterhoff, &c. Among the principal of these were the paper manufactory, and a lapidary mill, specimens of the pro-

* Described in your fifty-third volume.

ductions of each of which were given to me by Mr. Reed, on his last visit to England, and are now in my possession. In your nineteenth volume may be seen a description of "a double-power fire-engine," which had been constructed by Mr. Reed; interesting at this time, as a somewhat similar machine is now building for the city of Norwich. There is but little novelty in the idea, however, which had been worked out by Mr. Noble, and other English makers, but being found not advantageous, had been abandoned. The decease of Mr. Reed, in 1836, was noticed in your twenty-fifth volume. The talented son of a talented father was, by the keen-sighted Emperor, induced to turn his power in the direction most essential to the furtherance of the ambitious and aggrandizing policy of his country. The result is known.

May the passing events of the present time lead to all the improvements which they so strikingly suggest, and convince our rulers that to be secure of peace is to be prepared for war, and that a *time of peace* should ever be a *time of preparation!*

I am, Sir, yours, &c.,
WM. BADDELEY.

13, Angel-terrace, Islington,
September 1, 1855.

IMPOSSIBLE EQUATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—Your correspondent, "Ergo," cannot have paid much attention to the subject of Impossible Equations, or he could not have spoken so lightly of the equation which he has quoted from my Notæ. *He* may consider such a trifle as "unworthy of the philosophical speculation which has been bestowed upon it;" but there are others who know something of such matters, and yet think differently. In the solution of Impossible Equations, we are *restricted* to abide by the signs of the terms *as we find them*, and we are not at liberty to change from + to −, and *vice versâ*, when it suits our convenience.

When we have the equation

$$+\sqrt{1+x}+\sqrt{1-x}=1,$$

we must restrict ourselves to + signs, and hence, when $+\frac{\sqrt{3}}{2}$ is substituted for x, we find $+1\cdot36602+\cdot36602=1$, which *proves* that $x=+\frac{\sqrt{3}}{2}$ does not verify the original equation, and consequently $+\frac{\sqrt{3}}{2}$ is *not* a root. Again, take $x=-\frac{\sqrt{3}}{2}$, and substitute it in the given equation; we then find $+\cdot36602+1\cdot36602=1$, which once more proves that $x=-\frac{\sqrt{3}}{2}$ is *not* a root of the original equation. But these are the only values of x which result from rationalizing the given surd equation, and therefore when we restrict ourselves to the *signs as they stand*, the equation is impossible, or, in other words, does not admit of any root whatever.

Perhaps the preceding will be sufficient to convince "Ergo" that the "algebraical sleight of hand" is all on his own side, and that in solving such equations "when the left side is taken positive, the second must [*not*] be taken negative, and *vice versâ*." Whether there has been an "error of signs" in the process which led to this equation it is impossible for any one to determine; nor, indeed, is it at all material to the points at issue;—the only thing we are required to do is to find some value of x which will *verify* the equation as it now stands; and if this cannot be done, the equation belongs to that class which has been discussed by Messrs. Cockle, Harley, Finlay, Terquem, and Gilain, under the designation of Impossible Equations. From the last paragraph in his letter it also appears that "Ergo" requires to be informed that

$$+\sqrt{1+x}+\sqrt{1-x}=1,$$

and $$+\sqrt{1+x}-\sqrt{1-x}=1,$$

are *not identical equations*, but congeners to each other.

I remain, Sir, yours, &c.,
T. T. WILKINSON.

Burnley, Sept. 1, 1855.

EXPANSIVE MARINE ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—In reply to Mr. Allen's challenge, I beg to refer him to your valuable records for 1847, beginning 31st July, and the consecutive numbers for August and September. He will there find a variety of arrangements of engine combining all the requisites he desires. It is true that, as they occupy *much less* space than his engine, they will not work up to the same power at a pressure of 20 lbs. only; but that is what they were never intended to do. This, indeed, is the point in which I particularly differ with Mr. Allen, being assured that it will never answer to change the whole system of our marine engines for so trifling a difference of result as may be eked out from the expansion of steam, at such a low degree of pressure. The engines I refer to are working at 100 lbs. to 200 lbs. per inch—a pressure proper to realise the enormous economy residing in the expansive use of

[redacted]

steam; and he will find in connection with the engines a means of generating such steam in *perfect safety*—a claim not possessed by any other boilers in existence. He will likewise find a series of tables comprehending far more extensive economies than his own, and which tables have been the silent guide for ten years of the progressive use of expansive steam, by land as well as sea. Mr. Truran also (to whom I apologise for wrongly identifying) will see in the same pages, slide valves of greater simplicity of action than he seems yet to be aware of, and in which the disadvantage of steam pressure on the back of the slide does not exist. I am sure both Mr. Allen and Mr. Truran will be greatly interested in examining these details, and in testifying to the exceeding completeness with which all that they propose has been already executed. They will discover one more of numerous instances, how matters, so valuable that neither words nor figures can rightly scan that value, may become overlaid with succeeding matter comparatively trivial, and be forgotten. It is one evil of our great diffusion of knowledge, that it effects a great dilution of knowledge; fresh lucubrations accumulate, and valuables remain buried in lumber, like some precious Rafaelle entombed out of sight, in the back wilderness of a broker's shop. As to the Eastern Steam Navigation Company, it is true, precisely as Mr. Allen asserts, that I was playing loosely with a calculation based on the performances of a ship which is not yet built. There can be no objection in assuming, in a general calculation, all possible kind of data; quite otherwise, for the comparison obtained is more comprehensive.

I am, Sir, yours, &c.,

DAVID MUSHET.

September 3, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WILSON, GEORGE FERGUSSON, Belmont, Vauxhall, managing director of Price's Patent Candle Company, and GEORGE PAYNE, of the same place. *Improvements in treating glycerine.* Patent dated February 8, 1855. (No. 301.)

Claim.—Subjecting glycerine to a process of distillation after it has been separated from the fatty matters previously combined with it. Also, subjecting glycerine, after it has been separated from the fatty bodies previously combined with it, to the action of streams of steam.

RANSOME, FREDERICK, of Ipswich. *Improvements in drying articles of plastic materials.* Patent dated February 8, 1855. (No. 302.)

This invention consists in placing such articles in a close vessel or chamber, and highly heating them before the vapours of water are allowed to escape.

ADAMS, WILLIAM BRIDGES, of Adam-street, Adelphi, Middlesex, engineer. *Improvements in the construction and application of elastic springs for sustaining loads or moderating concussion in fixing or moving machines or carriages.* Patent dated February 9, 1855. (No. 306.)

A full description of this invention will be given hereafter.

LEES, JOHN, of Park-bridge Iron Works, Ashton-under-Lyne, Lancaster, and WILLIAM HEAP, of Ashton-under-Lyne, Lancaster, tool maker. *A new or improved machine or apparatus for cutting and straightening bars of metal.* Patent dated February 9, 1855. (No. 307.)

The first part of this machine is a circular saw, or other tool answering the same purpose, for cutting or shearing the original bar of metal into proper lengths. The bar of metal is presented to the cutting apparatus by a lever or combination of levers, and the proper length being cut off, it falls on to an inclined plane in passing down which it is intercepted by a number of points or prongs, which pass through apertures in the inclined plane, and which form the terminations of a lever or levers, or the terminations of a sliding bar connected with a lever or levers. The prongs being withdrawn at the proper time, the piece of bar cut off continues its course down the inclined plane, whence it passes to the second part of the apparatus which consists of a system of three or more rollers by the action of which it is straightened or stretched, and being completed, is then delivered from the machine. A third part of the machine is a cam shaft on which is placed a number of cams which, acting upon levers or slides, renders the whole apparatus self-acting. Another part of the invention consists in the application of an internal toothed wheel, and pinions, combined with universal joints for the purpose of giving motion to rollers, by the action of which the short bar of metal is straightened.

JOHNSON, WILLIAM BECKETT, of Manchester, Lancaster, manager for Messrs. Ormerod and Sons, engineers. *Improvements in steam boilers and engines.* Patent dated February 9, 1855. (No. 308.)

Claims.—1. The admission of air to furnaces by means of a tube or tubes passing vertically, or nearly so, through the boiler, and above the furnace or combustion chamber. 2. The use of tubes as stays for connecting the flat parts of furnaces, combustion chambers, or flues to the outer shell of the boiler. 3. The use of a certain air-

vessel and cock or valve. 4. As applied to air pump valves of engines, a method of mounting such valves whereby the openings are not obstructed by the parts which support them; also, the employment of two valves of conical form, the convexity of the one corresponding to the concavity of the other. 5. As applied to portable engines with horizontal tubes or flues, the use of a channel through the boiler at or about the centre thereof for the admission of the crank shaft; also, in such engine boilers, forming the furnace with a rounded top and parallel sides projecting downward. 6. Placing the brasses within the mounting, and also tightening them up by the same cottar which secures the piston rod to the mounting. 7. Forming that part of the piston rod which is adapted to the mounting thicker than the other portion thereof.

LANGMAN, JOHN, of Plymouth, Devon, architect. *Improvements in portable buildings specially adapted to campaigning purposes.* Patent dated February 9, 1855. (No. 311.)

A full description of this invention will be given hereafter.

BARNARD CHARLES, and JOHN BISHOP, of Norwich, Norfolk, ironmongers and copartners. *Improvements in apparatus for cutting vegetable substances* Patent dated February 10, 1855. (No. 312.)

This invention consists in casting upon the face of a flat or conical iron disc or cylinder a number of projections or teeth of a hooked form, either with or without clearance holes in front thereof, and in introducing, at suitable intervals, short knives or cutters standing out from the face of the disc at right angles thereto, and with their cutting edges inclined outward from the centre of the disc. This disc is mounted vertically on a central spindle with its toothed face towards a hopper, the sides of which are inclined so as to continually press the substances to be cut upon the cutters.

SPARKHALL, EDWARD, of Cheapside, London, printer. *Improvements in the exhibition of pictorial representations of various subjects.* Patent dated February 10, 1855. (No. 313.)

Claims.—1. Making or causing pictorial representations to revolve vertically, or move and pass laterally on either side of the spectator, simultaneously or otherwise. 2. Exhibiting transparent or other scenery moving or passing horizontally or obliquely in any direction above the spectator. 3. A moving platform or floor for the accommodation of spectators, vibrating, oscillating, or gyrating, at the option of the exhibiters.

INGALL, GEORGE HENRY, of Throgmorton-street, City, gentleman. *Certain improvements in telegraphic communications, and apparatus connected therewith.* Patent dated February 10, 1855. (No. 315.)

The action of the apparatus described by the inventor is as follows:—Upon the train leaving the terminus, a wheel is lowered sufficiently to strike a boss placed near the rails on its passing over it, and on the boss being struck, a copper plate on the top of a spring is depressed sufficiently low to break the electric current which is passing through certain wires; and the circuit being broken, the magnet in a dial apparatus is moved, a toothed wheel thus released, and a needle moved one division, thus indicating the passage of the train.

COTTAM, GEORGE HALLEN, and HENRY RICHARD COTTAM, of St. Pancras Iron Works, Old St. Pancras-road. *Improvements in the construction of iron buildings.* Patent dated February 10, 1855. (No. 316.)

This invention consists of a mode of constructing the inclosures and coverings of iron buildings with wrought-iron bars, of angle or T iron, in such manner that a space or opening is left between two upright bars for the reception of corrugated iron sheets, such sheets being lapped horizontally and also vertically, and the upright bars and sheets secured together by screw bolts.

BALK, WILLIAM, of Ipswich, Suffolk, engineer. *Improvements in machinery for crushing grain and other substances.* Patent dated February 10, 1855. (No. 317.)

In carrying out this invention, revolving disc plates or surfaces are combined with crushing rollers, and motion is given to these plates or surfaces whilst the axes of the crushing rollers run free, each crushing roller however receiving surface pressure on opposite sides of its axis by two surfaces moving in opposite directions, or, when one surface is stationary, by the other pressing surface moving twice the distance passed through by the central axis of the pressing roller.

SANDS, ALEXANDER, of Liverpool, Lancaster, ironfounder. *An improved fastening or detainer, to be employed as a substitute for "clothes pegs" or for other similar purposes.* (A communication.) Patent dated February 10, 1855. (No. 318.)

The patentee combines two pieces of wood or other material with a spring by the action of which their lower ends are pressed together.

BESNARD, LOUIS ADOLPHE FERDINAND, of Paris, France, gentleman. *An improved composition for fixing lithographs and engravings on canvas after being transposed or reproduced by a printing press.* Patent dated February 10, 1855. (No. 319.)

Claim.—"The preparation of a composi-

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tion and process of transferring and fixing lithographic images and engravings on cloth or canvas."

Bellford, Auguste Edouard Loradoux, of Essex-street, London. *Certain materials to be used for cementing and painting, and also applicable to printing and dressing or finishing fabrics.* (A communication.) Patent dated February 10, 1855. (No. 320.)

This invention consists in the application of alkaline silicates, or of several silicates with different bases, to the cementing, painting, printing, and dressing or finishing of fabrics.

Rennie, George, of Holland-street, Surrey, engineer. *Improvements in marine steam engines.* Patent dated February 10, 1855. (No. 321.)

We purpose giving a full description of this invention (with engravings) in a future Number.

Ramsbottom, John, of Longsight, near Manchester, engineer. *Improvements in the construction of certain metallic pistons.* Patent dated February 12, 1855. (No. 322.)

This invention consists of improvements in the mode of making the pistons patented by Mr. Ramsbottom, November 16, 1852. In order to obtain the form of the packing or spring rings so as to produce an uniform pressure against the cylinder, he bends a packing or other wire to a circle of the size of the cylinder in which the piston is to work, the ends just touching each other, and this wire is then subjected to fourteen or other convenient number of radial forces, which in the aggregate, amount to the pressure required for making a steam-tight joint.

Kerr, Robert, of Coleman-street, London, architect and surveyor. *Certain improvements in preparing loaf-sugar for use, and certain apparatus for the same.* Patent dated February 12, 1855. (No. 326.)

The inventor cuts a loaf of sugar first into slices or slabs, then across into squared sticks, and then again across into cubical pieces, by means of suitable apparatus.

Harris, Richard Shirley, of Leicester, gentleman. *Improvements in the manufacture of looped fabrics.* Patent dated February 12, 1855. (No. 327.)

This invention consists in making looped fabrics by means of guides, without the use of needles, hooks or pressers. Two guide bars are placed opposite to each other in an inclined position; the eyes of the guides are the highest parts, and the guides are threaded as usual. The loops are formed by lapping the threads over the opposite guides alternately, instead of lapping them on the needles.

Foster, John, of Long Eaton, in the county of Derby, machine builder. *Improvements in machinery for the manufacture of lace.* Patent dated February 12, 1855. (No. 328.)

This invention relates especially to what are known as Lever's twist lace machines, and consists in the employment of one or two half jack shafts placed above the net beam to work the landing bars of the machine.

Valery, Auguste, of Rouen, France, civil engineer. *An improved machinery for the preparation of flax, hemp, and other textile materials.* Patent dated February 13, 1855. (No. 331.)

This invention mainly consists in a "mode of applying points, pins, or needles, to the dividing, splitting and softening the fibres of textile plants, such as flax, hemp, china grass, &c., by a masticating motion, devoid of any longitudinal stroke or movement in the direction of the said fibres or filaments."

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in governors or regulators for steam engines or other prime movers.* (A communication.) Patent dated February 14, 1855. (No. 335.)

This invention relates to pneumatic governors, and consists—1. Of a peculiar construction and arrangement of valves for the admission of air either into the air-pumps or into the receiver of the regulator. 2. Of an improved form and arrangement of packing for the piston of the regulator. 3. Of a peculiar arrangement of the air passages for the discharge of the air and for the admission of air into the receiver. 4. Of a peculiar arrangement of apparatus whereby this pneumatic regulator may be applied to water-wheels.

Isaac, John Raphael, of Liverpool, Lancaster, draughtsman. *Improvements in the construction of portable buildings.* Patent dated February 14, 1855. (No. 336.)

The principal feature of this invention consists in forming the walls, floors, &c., of portable buildings, of portions united by means of hinges, and capable of being folded into a small compass.

Nichol, James, of Edinburgh, Scotland, bookseller. *Improvements in book-binding.* Patent dated February 14, 1855. (No. 337.)

This invention consists—1. With reference to the operation of covering books, in the use of rollers instead of hand labour. 2. With reference to the operation of "case-making," in certain means of cutting off the corners of the covers simultaneously, adjusting the boards on the cover mechanically, turning in the ends and sides of the cover, and fixing the cover smoothly on the boards by pressure, these several operations being either performed separately or

combined. 3. With reference to the operation of gilding the edges of books, in the application of mechanical pressure to the burnisher, instead of manual pressure. 4. With reference to the operation of "backing" books, in a particular form and construction of a certain described bar.

BLANCHARD, FRANCIS BROWN, of Maine, United States. *A new and useful apparatus for generating motive power from heated air, steam, and the products of combustion of coal or other fuel.* Patent dated February 14, 1855. (No. 339.)

"By this apparatus it is intended that the smoke arising from combustion shall be consumed within a closed furnace, and in connection with compressed air introduced into the furnace. The same may be said with regard to the volatile products of combustion that are susceptible of being consumed by heat, the volatile products that are not combustible being made to pass through the flues, and to yield a portion of their heat to the water of the boiler, so as to aid in the formation of steam, while they are subsequently united with steam and used as a force for operating the piston of a steam engine cylinder. The exhaust from the engine is to be caused to pass through a tubular feed-water vessel (in communication with the boiler) and from thence through an air vessel of similar construction made to communicate with the furnace. The exhaust enters the top, and passes off at the bottom of each. The coldest portion being the heavier, passes off, while the lighter and hotter remains in the vessel until it has expended its heat when it passes downward and gives place to other portions that may be flowing into the vessel. Steam if formed in the water vessel will pass into the boiler. In this manner a portion of the heat which would otherwise be lost in the exhaust is carried back into the furnace, and again made to do duty."

BLYTHE, WILLIAM, of Oswaldtwistle, Lancaster, manufacturing chemist, and EMILE KOPP, of Accrington, Lancaster, chemist. *Improvements in the manufacture of soda ash and sulphuric acid.* Patent dated February 15, 1855. (No. 340.)

This invention consists in the use of the oxides and carbonates of manganese, zinc, copper and lead, instead of lime, or carbonate of lime, in the manufacture of black ash or crude soda from which soda ash is obtained.

MOLESWORTH, ROBERT, of Half-moon-street, Bishopsgate-street, London, brush-maker. *Improvements in the construction of brushes.* Patent dated February 15, 1855. (No. 341.)

The inventor makes the handle and hair-block of the brush in one piece of wood, or other suitable material, and gives to the block a peculiar form, the part next the handle being cylindrical, while that to which the bristles are attached is a truncated cone, with the base towards the outer or brush end, and the smaller end next the cylindrical portion of the block, thus producing a shoulder against which the combined ends of the bristles abut.

GOWER, BENJAMIN, of Stratford, Essex, engineer. *Improvements in cannons and pieces of ordnance, and in shot and projectiles for cannon and pieces of ordnance.* Patent dated February 15, 1855. (No. 343.)

Claims.—1. The combination of the barrel of a cannon or piece of ordnance with an enlarged chamber or breech, or several enlarged chambers or breeches, contained in a movable breech-piece, and the mode of connecting such a barrel and breech-piece by means of a strap and vertical pin or bolt. 2. The mode of constructing oblong shot or projectiles with longitudinal orifices through them, and also with rings of soft material round them.

MASON, JOHN, of Rochdale, Lancaster, machinist, SAMUEL THORNTON, of the same place, and THOMAS SPENCER SAWYER, of Longsight, same county, engineer. *Improvements in finishing or polishing and drying yarns or threads.* Patent dated February 15, 1855. (No. 344.)

Claims.—1. The use of a stationary steam or otherwise heated surface or surfaces situate on the outside of the framing. 2. The use of a roller or rollers, over which the yarn passes, capable of being advanced towards or drawn from such heated surfaces. 3. As applied to double, quadruple, or other multiplicate machines, the use of one heated surface for two sets of hanks of yarn. 4. The application of a steam or otherwise heated surface or surfaces to the interior of the hank, in combination with a heating surface on the exterior thereof. 5. Applying a friction surface to the outside of the yarn as it passes over the heated surface. 6. Applying friction to the yarn as it passes over a roller or rollers, by which it is caused to travel. 7. In reference to machines with heating surface or surfaces stationary during the operation upon the material, the mounting of one of the yarn rollers so that it may be moved around the centre from which it is driven, or around another centre sufficiently near to answer the same purpose; also suspending one of the rollers within the hanks of yarn; &c. 8. The application of certain materials as media for imparting friction to the yarn. 9. The use of a stationary heated surface around which a looped up portion of the yarn is caused to travel; also causing the said heated surface to revolve, the parts which hold the looped up portion being sta-

[redacted]

tionary. 10. In machines provided with steam chests stationary during the operation upon the material, the use of brushes or wire cards placed on either side of the hand, which material at the same time passes over rollers. 11. Grooving the roller or rollers by which the yarn is driven; also, in reference to such rollers, constructing them with annular recesses, rings or pegs. 12. As applied to machines in which a heated surface is employed, and in which the yarn is operated upon outside the framework; the use of guides placed between the hanks in any suitable part of the machine. 13. Grooving that part of the heated surface over which the yarn passes. 14. Causing the yarn to pass over rollers which revolve at unequal speeds as regards their surfaces. 15. The application of a rotatory friction surface situate within the hanks, another part thereof being in contact with a heated surface. 16. The use of an apparatus similar to a swift or reel, for conveying the yarn bodily against a friction surface, and also, at the same time, imparting an independent travelling motion to the yarn. Also the use of a fan mounted within the revolving hanks. 17. Mounting the hanks upon rollers which convey them bodily against friction surfaces, such rollers imparting, at the same time, an independent travelling motion. 18. Causing yarn, during the process of finishing or polishing, to pass over a vessel, through apertures formed in which, and corresponding to the situation of the yarn, air is blown or drawn. 19. In reference to the machine patented by W. E. Newton, February 17, 1846, making the vanes thereof hollow, and heating them; also the application to such machines of an additional steam or otherwise heated surface. 20. In reference to the drying of yarns in the bleaching, dyeing, or other wet process, stringing such yarns upon rods mounted on radial arms, and causing the same to revolve.

Spencer, Henry, of Rochdale, Lancaster, manager. *Improvements in machinery for preparing and spinning cotton and other fibrous substances.* Patent dated February 15, 1855. (No. 345.)

Claims 1.—The use of "strickles" so constructed and adapted to carding engines that in their traversing motion they shall remain in contact with the whole width of cards. 2. Bending the upper ends of throstle flyers inward, and providing the bobbin with a recess to receive such bent part; also providing the bobbin with a recess for admitting the boss of the flyer.

Delabarre, Cristophe François, of Paris, France. *Improved apparatus to be used in propelling gases and forcing liquids.* Patent dated February 15, 1855. (No. 346.)

Claim.—"The use and employment of a mixture of steam and air or other gases, instead of the apparatus now in use for the same purpose, the said mixture being obtained and applied by projecting a relatively small, and more or less compressed, current of steam or other attracting fluid, into a large single or multiple recipient pipe or channel, so as to give access to, and cause the attraction of, a considerable mass of air to be carried along with the steam," &c.

Spence, William, of Chancery-lane, Middlesex. *Improvements in substitutes for glass for ornamental purposes.* (A communication.) Patent dated February 16, 1855. (No. 347.)

This invention consists in the substitution for glass, of varnishes, gums, silicates, or metallic or other compositions, formed into plates or sheets, and rendered capable of being applied to surfaces of various forms suitable for ornamental purposes.

Carless, Eugene, of Stepney, Middlesex. *Improvements in the manufacture of paper cloth, known as artificial leather, and in coating or covering the surface thereof with colouring matter, the said colouring process being also adapted to the colouring or staining of paper.* Patent dated February 16, 1855. (No. 348.)

This invention consists—1. In adapting a certain arrangement of mechanism for performing the operations of connecting the paper and the cloth together, and afterwards drying the same, without removing it from the machine for that purpose. 2. Colouring or staining paper by means of brushes revolving or moving horizontally over a plane surface.

Percy, William Carter Stafford, machinist, and William Craven, engineer and tool-maker, of Vauxhall Iron Works, Collyhurst-road, Manchester, Lancaster. *Improvements in the manufacture, and in machinery and apparatus used in the manufacture of bricks, tiles, pipes, and other articles made from plastic materials.* Patent dated February 16, 1855. (No. 350.)

This invention consists—1. In tempering plastic materials by the application of steam. 2. In forming a pugging mill with perforated sides, and knives so arranged as to force the clay through the perforations, there being a hole in the bottom of the mill through which stones, &c., fall. 3. In employing a pair or a series of feed rollers for propelling the material through the chamber into the mould-boxes. 4. Drying the moulded articles by means of draughts of air produced mechanically. 5. Wetting the sides of the mould-chambers by means of a porous lining. 6. In a mode of manufacturing hollow bricks, tiles, and other similar hollow articles by first moulding

the material roughly to the external shape and dimensions of the article required, and then, when partially dried, subjecting it to pressure, by dies and in moulds, in order to make it hollow and give it the required external form, &c.

MANEGLIA, FORTUNATO GAETANO PIETRO MARIA VITTORIO, of the Turin and Genoa railway. *Improvements in railway carriages.* Patent dated February 16, 1855. (No. 353.)

This invention consists in connecting the bodies of railway carriages with the frame (to which the wheels and axles are attached) by means of levers, which are arranged so that the weight of the body compresses discs of vulcanized India-rubber contained in a tube and separated from each other by discs of metal, the necessary elasticity being thus obtained. The traction hooks are arranged similarly.

WRIGHT, SAMUEL BARLOW, of Parkfields, Stone, Staffordshire, and HENRY THOMAS GREEN, of Moreton, Staffordshire. *Improvements in the manufacture of encaustic tiles.* Patent dated February 16, 1855. (No. 355.)

This invention mainly consists in printing on a continuous sheet of clay by a roller or pattern surface, and in filling the indentations thus produced by passing the printed sheet under a trough containing clay of a colour different from the body of the sheet.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MARYON, ROBERT JAMES, (engineer, civil) of York-road, Lambeth, Surrey. *Improvement or improvements in the construction of, and manufacture of, ordnance, part or section of his said invention he applies for improvements in the construction of fire arms of every class.* Application dated February 8, 1855. (No. 308.)

The inventor constructs a gun "in two parts for the better means of carriage or portability, and to obtain greater strength; and my said ordnance," he says, "I construct with angular double barrels. I construct my gun bore on a conical principle connected and communicating with one touch hole, or its equivalent igniting means or agent for to effect discharge simultaneously."

ARMSDELL, CHARLES, of Fenchurch-street, London, painter. *An improved sifter or shovel.* Application dated February 9, 1855. (No. 304.)

This invention consists in constructing a shovel with a double bottom, the under one being solid, while the upper bottom is inclined from the front towards the back. It has gratings, apertures, or perforations made therein. The back of the shovel is formed into a box closed at front by a flap opened by a rod passing through the back-plate, or otherwise; the handle is made hollow, or an opening is provided at the back of the box, for emptying the contents thereof; or the inclined perforated plate or grating may be made to lift upon a hinge, and the contents may be thrown out from the front of the shovel. The sifter is intended chiefly for cinders, but it may be advantageously employed for screening coal, grain, and other matters requiring to be sifted.

MARTIN, JOSEPH, of Liverpool, Lancaster, corn and rice miller and merchant. *Improvements in machinery for treating wheat and other grain.* Application dated February 9, 1855. (No. 305.)

In carrying out this invention, after grain has been washed, or otherwise moistened, the moisture adhering to it is removed by means of the centrifugal force created by a revolving drum made of perforated sheet metal or wirework, through which drum the grain is carried in a continuous stream by a worm or other means.

PONT, BARTHELEMY, of Rue Bourdaloue, Paris, France, photographic artist. *A process of autographic engraving.* Application dated February 9, 1855. (No. 309.)

"The difference that exists between the present system of photography and my invention is this," says the inventor; "in the photographic system the object-glass plays the principal part; for it is by means of the instrument that a picture existing in nature, or in any drawing whatever, is produced upon the collodion-plate, whereas my invention entirely supersedes the object-glass, and it is the plate itself on which the artist has made his engraving, which gives the most faithful impressions."

PARKER, FRANCIS, of Waterloo, Northampton. *An improvement in the manufacture of paper.* Application dated February 9, 1855. (No. 310.)

This improvement consists in the manufacture of pulp, to be used in the manufacture of paper, from the stalk of the potatoe plant.

RUSSELL, SAMUEL, of Porter-street, Sheffield, York. *Improvements in projectiles for fire-arms and ordnance.* Application dated February 10, 1855. (No. 315.)

This invention consists in coating or covering balls either wholly or partially with gun-wadding, felt, or other similar material, and in forming hollow shot with smaller shot within them, and with fulminating powder between the two, so that when the outer shot strikes an object the inner one shall discharge the fulminating powder, and produce an injurious explosion.

SMITH, SAMUEL, of Manchester, cotton-

[redacted]

spinner. *Improvements in machinery for winding cotton and other yarns or threads.* Application dated February 12, 1855. (No. 323.)

These improvements are applicable to the ordinary spindle winding machines, and consist in imparting, by means of cone pulleys, a variable speed to the bobbins on which the yarn is wound, this variable motion being made to correspond with the increasing diameter of the bobbins.

LUCAS, GEORGE, of Hulme, Manchester, mechanic. *Certain improvements in machinery for preparing, spinning, doubling and twisting cotton, wool, silk, and other fibrous materials.* Application dated February 12, 1855. (No. 324.)

This invention consists—1. In certain improvements in spindles and flyers. 2. In the application of an elastic thread guide or thread wire, which, by yielding to any excess of pressure, avoids all sudden check on the yarn betwixt the roller and the spindle. 3. In an improved copping motion, by the action of which the cop is built. A pair of differential wheels (one of which is fixed) are connected together by a pinion, and combined with a lever and cam, which act on a scroll, from which proceeds a chain, strap or band to the lifting rail of the throstle. 4. In the application of, or in a new mode of applying, gutta percha as a substitute for the leather and roller cloth used for the purpose of covering the top rollers of spinning machines, &c.

BARR, DAVID, commercial clerk, of Daleend, Birmingham. *A new or improved tap for hot and cold fluids, steam, and gases.* Application dated February 12, 1855. (No. 325.)

In this invention a plug tapered down at one end is fitted into a cylinder or barrel, as a substitute for the ordinary valve. A chain, hook, or other handle is attached to the plug to draw it back, so as to form a passage or outlet. The plug on being loosed is immediately made to close up the aperture by the pressure from within, or by means of a spiral or other spring placed inside the tap when this is required.

SMITH, SAMUEL, of Manchester, spinner, and MOSES MORRIS, of Swinton, near Manchester, overlooker. *An improved machine for spinning cotton and other fibrous materials.* Application dated February 13, 1855. (No. 329.)

This invention consists of an improved flyer which instead of being fixed to the spindle is supported by antifriction rollers. This flyer is driven by a band to which motion is communicated in any convenient manner. The spindles or tubes on which the cops are formed are turned round by the drag or force of the yarn passing through the flyer, and the amount of drag can be increased or diminished by giving more or less friction to the spindle. The spindle frame is moved up and down by means of cams acting on suitable levers.

LAMBOT, JOSEPH LOUIS, of Carces, Department of Var, France. *An improved building material to be used as a substitute for wood.* Application dated February 13, 1855. (No. 330.)

This invention refers to a building material to be used as a substitute for wood in naval and architectural constructions, and also for other domestic purposes where dampness is to be avoided. It is formed of a network, or a parallel set of wires or metallic bars or rods, imbedded or cemented together with hydraulic or other cementing matter, so as to form beams or planks of any suitable size.

COMFIELD, ROBERT PETRIE, of Upper Holloway, Middlesex, gentleman. *Improvements in the electro-coating of iron and other metals with zinc and other metals.* (Partly a communication.) Application dated February 13, 1855. (No. 332.)

"Heretofore," says the inventor, "it has been usual in coating metals by electro-depositions to employ prepared solutions of the metals to be deposited; in place of which I employ solutions of zinc and other metals produced in galvanic batteries."

DALTON, GEORGE, of Lymington, Southampton, gentleman. *Improvements in reverberatory furnaces.* Application dated February 13, 1855. (No. 333.)

This invention consists in constructing at the sides and back of the ash pit of reverberatory furnaces air chambers with numerous perforations or openings into the ash pit, so that the air which enters them from the ash pit, or from external openings, shall become heated, and pass into the ash pit divided into numerous streams.

METCALFE, THOMAS, mechanic; WILLIAM SLADING, cotton-printer; and JOHN METCALFE, mechanic, of Clitheroe, Lancaster. *An improvement in the machines for preparing cotton known as Dyer's tube-frames.* Application dated February 14, 1855. (No. 334.)

This invention consists in putting twist into the rovings of Dyer's tube-frames.

PATTINSON, HUGH LEE, jun., of Stotes Hall, Jesmond, Newcastle-upon-Tyne. *An improvement in the manufacture of iron carriage-wheels.* Application dated February 14, 1855. (No. 338.)

This invention has for its object the employment of wrought-iron tubes, or wrought iron of a hollow form, for making the hoops or felloes of carriage-wheels.

LEADBETTER, JAMES, of Halifax, York, brazier. *Improvements in the mode or method*

of applying breaks to railway and other carriages. Application dated February 15, 1855. (No. 342.)

The inventor proposes to fix on each axle or cross shaft a pulley or a toothed wheel, on which shall act a spring connected to a draw bar or continuous chain, which, when acted upon, will stop or retard the revolution of the wheels.

ABBOTT, WILLIAM, gentleman, of Lansdowne-place, Richmond, Surrey. *A boot and shoe-cleaning machine.* Application dated February 16, 1855. (No. 349.)

This machine is formed of a framework of wood, iron, or any other kind of material, supporting a spindle which carries circular brushes in a wood or iron block, and a small cog wheel or wheel for a band; also a second spindle for a handle, with a larger cog wheel or wheel for a band.

RICHARD ARCHIBALD BROOMAN, of 166, Fleet-street, in the City of London, patent-agent. *A means of preparing the fibres of certain plants of the bean species, in order to form them into pulp, and to fit them for manufacturing purposes.* Application dated February 16, 1855. (No. 351.)

This invention relates to plants of the description known as French beans, scarlet-runners, &c. The plants are first boiled, then allowed to drain, and afterwards subjected to strong pressure. They are then again boiled, and removed to a rubbing machine, in which the parts of the plants are rubbed together until dry, in which state the fibres are separated from the coarser parts by a scutching machine. The coarser parts are then reduced by boiling to a pulp fit for the manufacture of paper, while the other fibres may be employed for various manufacturing purposes.

PATTINSON, HUGH LEE, jun., of Stotes Hall, near Newcastle-upon-Tyne. *An improvement in the manufacture of wrought-iron tubes.* Application dated February 16, 1855. (No. 352.)

This invention consists in the manufacture of wrought-iron tubes without seams or welds, by forcing wrought iron, when in a highly heated state, through dies or openings having stationary or fixed cores.

BLACKBURN, ROBERT, of Wandsworth Paper-mills, Wandsworth, and WILLIAM LUNDI DUNCAN, of Bridgefield-terrace, Wandsworth. *Improvements in bleaching.* Application dated February 16, 1855. (No. 354.)

This invention consists in causing cloths or yarns to be moved in an extended state in the liquors employed in bleaching, in such manner that the several vessels required shall be contiguous to each other, and the cloths or yarns enter the liquor in *the first, and after* circulating several times therein pass into and circulate in the liquor in the next vessel, &c.

PROVISIONAL PROTECTIONS.

Dated July 7, 1855.

1523. John Gedge, of Wellington-street South, Middlesex. Improvements in photographic glasses. A communication from Louis Samson, of Paris, France.

Dated July 10, 1855.

1537. François Loret-Vermeersch, of Malines, Belgium. The improvement of looms for weaving.

Dated July 26, 1855.

1695. James Beattie, of Hans-place, Chelsea, Middlesex, gentleman. A combination of contrivance of a folding mattress (with or without a tent attached), hut, ambulance for conveyance of wounded or sick persons, pontoon raft and boat, portable cistern and bath.

Dated August 2, 1855.

1753. Daniel Airey, of Preston, Lancaster, engineer, and William Henry Lackabane, of the same place, mechanic. Improvements in rotatory steam-engines.

Dated August 3, 1855.

1755. Henry Hough Watson, of Bolton-le-Moors, Lancaster, analytical chemist. Improvements in the manufacture of coke.

1764. Charles Ritchie, of New Palace-yard, and George Ritchie, of Millbank-street, Westminster. Improvements in preparing cork and other materials for stuffing.

Dated August 4, 1855.

1769. Henri Louis Racine Perrot, of Chaux de Fonds, Switzerland, watch manufacturer. An improved escapement for chronometers.

1771. Edward Whiteman, of Riverhead, Sevenoaks, Kent, glover and gaiter-maker. An improvement in the manufacture of waterproof coats, boots, capes, overalls, and other garments.

1773. Edward Hall, of Dartford, Kent, engineer. Improvements in the manufacture of gunpowder.

Dated August 6, 1855.

1775. John Gedge, of Wellington-street South, Middlesex. Obtaining and employing motive power. A communication from Aristide Ratte, civil engineer, Marseilles, France.

1777. John Avery, of Essex-street, London. Improvements in windlasses for ships and other purposes. A communication.

1779. Fischer Alexander Wilson, of Islington, Middlesex. A portable cooking apparatus, suitable for campaigning purposes.

1781. Henri Auguste Pradel, manufacturer, of Paris, French empire. Certain improvements in twisting textile goods or fabrics. A communication.

Dated August 7, 1855.

1783. James Hamnett, of Broadbottom, Chester, overlooker. Improvements in shuttle tongues.

1785. Samuel Cunliffe Lister, of Bradford, York. Improvements in hackling, combing, and treating flax, wool, and other fibrous materials, before being spun.

1787. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of India-rubber. A communication from Austin S. Day, of the United States.

1789. William Jeremiah Murphy, of Cork, Ireland, distiller. Improvements in obtaining motive power.

Dated August 8, 1855.

1791. William Hopkinson, of Huddersfield, York, engineer. Improvements in steam-engine boilers, furnaces, and apparatus connected therewith.

1793. William Baron, overlooker, Joseph Lang, overlooker, and Henry Liversage, reed-maker, of Blackburn, Lancaster. Improvements applicable to machinery for winding and for sizing or dressing yarns or threads.

1796. John Coope Haddan, of Cannon-row, Westminster, civil engineer. Improvements in the manufacture of rifled and other cannon.

1797. Philippe Amédée Devy, of Old Jewry-chambers, Old Jewry. Improvements in hair fabrics. A communication.

Dated August 9, 1855.

1799. John Sidebottom, of Broadbottom, Chester, manufacturer. Improvements in shuttles and in skewers for shuttles and other purposes.

1801. Edward Cooke, of Balsall-heath, near Birmingham, Warwick, accountant clerk. An improvement or improvements in moulds used in casting certain parts of metallic furniture.

1805. George Henry Bachoffner, of Upper Montague-street, Montague-square, Middlesex. Improvements in appropriating certain public erections for advertising purposes.

1807. William Bridges Adams, of Adam-street, Adelphi, Middlesex, engineer. Improvements in locomotive engines and their trains.

Dated August 15, 1855.

1854. Francis May, of Tooley-street, Southwark, merchant. Improvements in obtaining instantaneous light. A communication from Johan Edward Lundström, of Jönköping, Sweden.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1902. William Pitt and Edward Turner Davies, of Birmingham, Warwick, brassfounders. Improvements in the manufacture of cornice-poles and picture-rods, and in rings and chains to be used in connection therewith. August 22, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September* 4*th,* 1855.)

919. Henry Cockcroft. A self-registering letter-box.

948. Robert Paul Coignet. Certain improvements for rendering tissues waterproof.

956. Edward Myers and John Wright Potter. Improvements in stoves for warming apartments.

957. Richard Clark and John Thomas Stroud. Certain improvements in lighting, applicable to table, street, signal, and other lamps, as also for the constructing, denoting, and regulating the signals and burners of lighthouses.

959. Daniel Warren. Certain improvements in obtaining and applying motive power.

980. Robert Adcock. Improvements in the purifying processes of alcoholic liquids. A communication.

988. Marie Amédié Charles Mellier. An improvement in the manufacture of paper.

999. John Hamilton, junior. Improvements in the construction of iron girders.

1000. Daniel Dalton. Improvements in furnaces for the smelting iron ore and iron stone and other stones and ores.

1005. James Hill Dickson. Improvements in machinery for scutching and heckling flax, hemp, and other vegetable fibres.

1025. Joseph Hughes. Improvements in the manufacture of paper.

1031. James Bowron. An improvement in the manufacture of glass tiles.

1102. Thomas Richardson. An improvement in dyeing cloth.

1113. Thomas Dawson. Improvements in cases for containing pen, ink, and stamps.

1196. John Aspinall. Improvements in machinery for extracting moisture from substances, and for separating liquid from solid bodies, applicable to the refining of sugar, drying of goods, and to purposes for which centrifugal machines are employed.

1224. Jean Baptiste Acklin. Improvements in the mode of substituting paper to pasteboards in Jacquard looms.

1243. Charles Tennant Dunlop. Improvements in the manufacture of chlorine.

1268. Peter Augustin Godefroy. Improvements in the treatment of gutta percha.

1434. Stephen White. Improvements in washing, cleansing, and drying grain.

1550. John Coulson. Improvements in apparatus for ventilating mines, which improvements are also applicable to other purposes where ventilation is required.

1587. Francis Burke. Improvements in obtaining or preparing the fibres of the plantain or banana aloe and other vegetables for various manufacturing purposes.

1625. John Pretty Clarke. An improvement in the manufacture of metallic reels.

1674. Henry Stent. Improvements in the construction of apparatus for measuring gas and other fluids.

1743. John Clarke. Improvements in machinery for making loop fabrics.

1755. Henry Hough Watson. Improvements in the manufacture of coke.

1773. Edward Hall. Improvements in the manufacture of gunpowder.

1848. Samuel Statham and Willoughby Smith. Improvements in electric telegraph cables, or cores for the same.

1854. Francis May. Improvements in obtaining instantaneous light. A communication from Johan Edward Lundström, of Jönköping, Sweden.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed August 31, 1855.

465. John Johnson.
469. John Woodley and Henry Herbert Swinford.
482. John Gledhill and Robert Gledhill.
502. John Kennedy.
516. George Hazeldine.
574. Edmund Johnson Mitchell.
1442. Frederick William Mowbray.

Sealed September 4, 1855.

483. Lewis James Paine and John Ryan.
489. John Lewis.

504. Joseph Cooper.
519. John Taylor.
520. Henry Gilbert.
552. John Gilbert.
588. George Grignon.
630. Alfred Vincent Newton.
636. Matthew Semple.
646. William Young.
689. George Hall Nicoll.
698. James Porritt.
1016. Johnson Hands.
1081. John Dupre.
1203. John Avery.
1431. William Teall.
1451. Sydney Smith.
1505. John Inglis and Archibald Cowie.
1562. James Caldow and James Bainden Affleck M'Kinnel.
1572. Robert Cochran.
1578. Louis Roch.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Edinensis.—The French government publishes an annual catalogue of patents and certificates of addition granted in France.

H. V. S., Birmingham. By the provisions of the Patent Law Amendment Act, courts of common law are authorized to grant injunctions in cases of infringements. In the case to which you allude, the patent was overthrown owing to evidence having been produced to prove the sale of the patented articles prior to the date of the patent.

H. G.—The results of the experiments to which you refer on hollow and solid axles will be found in Vol. 59, page 263.

An Engineer.—The dates of the two patents are respectively 24th July, 1844, and 15th October, 1846. Juckes' patent was extended for three years from 4th September last.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

[redacted]

Mechanics' Magazine.

No. 1675.] SATURDAY, SEPTEMBER 15, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

RUSSELL'S AMERICAN GRASS-MOWING MACHINE.

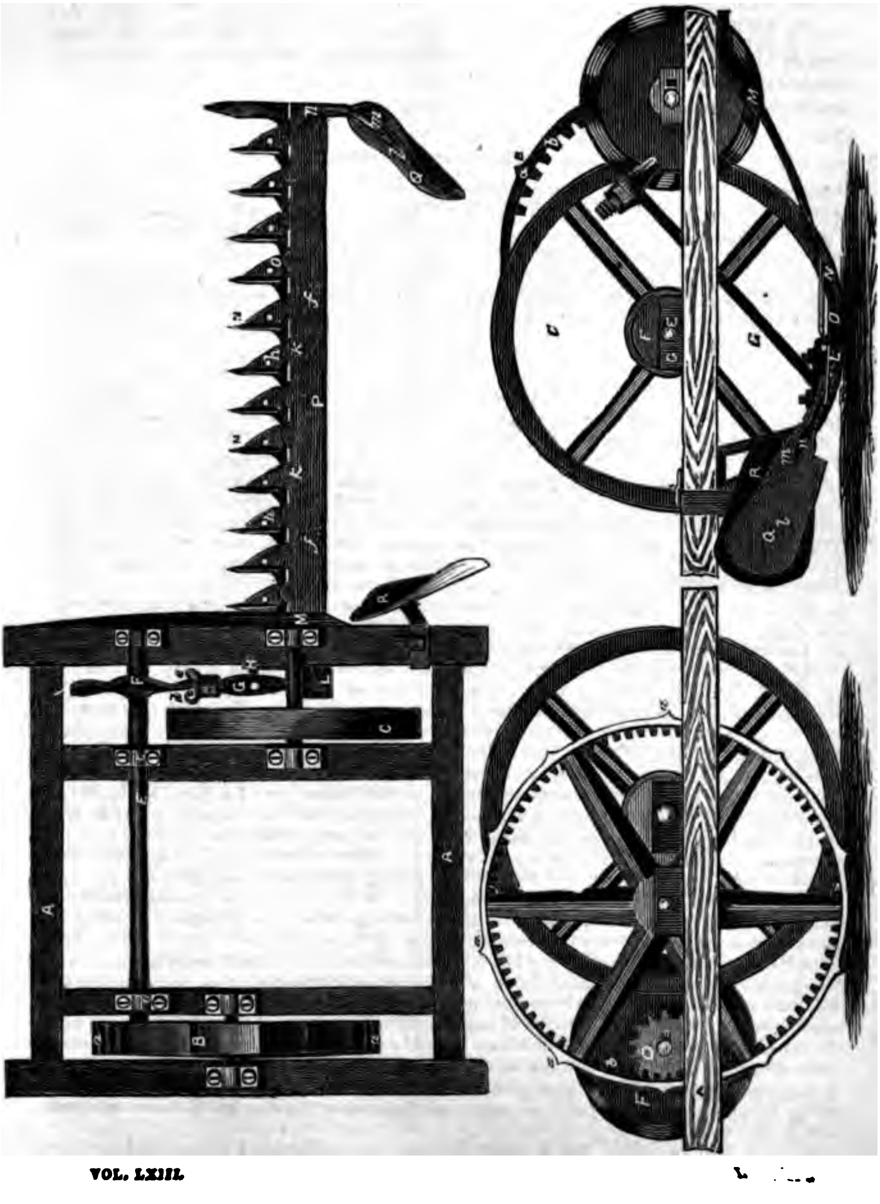

Fig. 3

Fig. 2

RUSSELL'S AMERICAN GRASS-MOWING MACHINE.

(Patent dated November 21, 1854.)

FIGURE 1 of the accompanying engravings represents a top view of a machine for mowing grass patented on the above day, by Mr. Fisk Russell, of Massachusetts; fig. 2 is a side elevation of it taken on that side at which the primary or driving wheel is situated; fig. 3 is an elevation of the opposite side of it; fig. 4 is a longitudinal section of the knife or cutter bar, and exhibits the arrangement of the knives, and the manner in which they are applied thereto; fig. 5 is a transverse sectional view of the driving cam and its bifurcated rocker frame and lever; fig. 6 is a transverse section of the cutter bar and its cutters, exhibiting a sectional view of one of the guard teeth; and fig. 7 is a top view of one of the knives separated from the machine. A is a carriage or main rectangular frame, supported on two wheels B, C, the former being a driving as well as a supporting wheel; that is to say, its periphery is armed with a series of projections or teeth *a*, *a*, extended from it, as in the wheels of other well-known reaping machines. This wheel carries on the inner surface of its rim an internal gear *b*, into which a pinion D, affixed to one end of a driving shaft E, is made to engage. This driving shaft extends across the frame, and is supported in boxes, as seen at *c*, *c*, and carries a cam wheel F. The axis of the secondary wheel C is not disposed in line with that of the primary wheel B, but is arranged by the side of the same, and so that the secondary wheel is disposed entirely on one side of the driving or cam shaft, it being understood that the two wheels are made of the same, or about the same, diameter. The cam is so formed as to impart a reciprocating vibrating movement to an inclined lever G, which works on a fulcrum at H. This lever carries a bifurcated rocker frame I, that is made to turn in one end of the lever, and to clasp the serpentine edge of the cam wheel, and to carry two friction rollers *d*, *e*, placed on opposite sides of the cam wheel. By means of the rocker frame the cam wheel is enabled to work the lever to greater advantage, and with less noise and friction, than would be the case were the lever applied to the cam by means of a stationary fork or its equivalent. The lower end of the lever extends into a mortice made in a long slide bar K, that is supported so as to slide in a groove formed in the cutter bar L, fastened to and extending from a holdfast M, as shown in the engravings, the said holdfast being a bent piece of metal formed and made to extend down as in fig. 3. The cutter bar L has projected from it a series of guard or hook teeth, as seen at N, N, between each two of which a moveable oscillating tooth O is made to play, the said tooth being made to turn horizontally upon a centre pin or fulcrum *f*, extended upwards from the cutter bar. In the construction of these teeth, they are formed triangular, or nearly so, in shape, and two of them are made to extend in opposite directions from one common centre plate or bar *g*. Each of these teeth has a round hole *h* formed through it, each hole being at an equal distance from the hole *i* of the central plate. The lever teeth so formed are arranged on the cutter bar, as shown, their central holes being supported on stationary fulcra or pins *k*, *k*, while their back or rearmost holes are made respectively to receive pins extending upward from the slide bar K. When the teeth are so arranged they may be covered by a cap plate P, made to extend partially over them. By the reciprocating longitudinal movement of the slide bar, each of the cutting teeth directly between the guard teeth will have imparted to it an oscillating movement, such as will cause it to cut not only with a guard tooth, like a common pair of scissors, but also with a slight drawing stroke, such as will impart to it a great advantage in severing grass. Should any one of the teeth become dulled or injured, it may be removed from its fulcrum and turned around over the sliding bar, so as to bring its fellow tooth into its place; the fellow tooth, having been placed under the cap plate of the cutter bar, will be protected by it from injury. To the outer end of the cutter frame is affixed a raking board Q, constructed in the following manner (the object of it being to move the cut grass away from the standing grass). This board is made in two independent parts *l*, *m*, each of which is affixed to the raking or cutting bar, the back board being applied thereto by a spring *n*, which allows it to play up and down, and slide on the front board while the latter is stationary. "As raking boards have heretofore been constructed under such an application, the horizontal and upright parts have been connected together," says the inventor, "and so hinged to the cutter bar as to cause both to rise simultaneously when passing over an obstruction. In my improved raking board, the upper portion or front part remains stationary, while the other portion is moveable, such a method of constructing a raking board causing it to operate to much better advantage than when made in the other way, as above set forth.

"*I apply*," *he continues*, "to the main frame of the machine, or I arrange and combine

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with the cutter bar adjacent to and in rear of its junction with the main frame, and in rear of the cutter immediately next thereto, a grass-turning or raking board R, the same being applied so as to turn *over* and *away* from the frame the cut grass of a swath, in order that

Fig. 4.

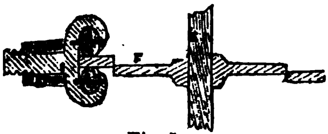

Fig. 5. Fig. 6. Fig. 7.

when the machine is returned over and made to cut that over which it was previously carried, there may be a clear path for the knife-bar holdfast to travel in. Without the application of the raking boards, in the above described manner, such path would be likely to be obstructed by the cut grass or grain, and to an extent disadvantageous to the correct operation of the machine."

AMERICAN IMPROVEMENTS IN OBTAINING MOTIVE POWER.

Attention has recently been drawn by the journals of America to two attempts which have been made to supersede the use of ordinary steam as a source of motive power. The author of one of these is Mr. Storms, of New York, who proposes to employ a *cloud combination of steam and air;* the author of the other is Mr. Hughes, of Rochester, who has exhibited an engine, worked by bi-sulphuret of carbon, at the Bank of the Republic Building, New York.

STORMS' CLOUD ENGINE.

The following outline of the principles on which the apparent gain obtained by the combination of air and steam over those from steam alone is explained, is given in the *New York Tribune:*

Mr. Wm. Mount Storms, of this city, a gentleman apparently well versed in all that relates to these interesting and extensive subjects, professes to have made new discoveries or applications of natural laws, which are to result in increasing the efficiency of a given amount of fuel in the steam-engine. The company formed to carry out and apply the intentions of Mr. Storms, have subjected the theory to the test of several expensive experiments, and one engine of respectable size constructed on this plan, has been for some months in actual daily use, driving the fans and other machinery of a small foundry and machine-shop. The plan consists in mixing cold air with ordinary steam. It is assumed that in addition to the familiar forms of ice, water, and steam, the aqueous element is capable of existing in a state of vesicular vapour, or opaque steam, a form more familiar to the eye than the transparent steam, but never before suspected of possessing any mechanical power above or even equal to that of the latter.

If a glass bull's eye be introduced in the top or side of an ordinary steam-boiler, the steam within is found to be perfectly transparent and invisible. But on turning a cock the escaping steam is found to be white and cloud-like. This is due to the cooling effect of the air, which mixes with and apparently condenses it. Mr. Storms' experiments lead him to the conclusion, that the volume of the whole is increased by the combination, and this to a very considerable degree, as high under favourable circumstances as 75 per cent., and consequently affording a corresponding increase of efficiency in an engine. If common air be compressed and introduced at an ordinary temperature into a vessel containing steam at the same pressure, the following effects may be anticipated. On the one hand a portion of the steam will be condensed and changed to water, which will diminish the pressure; but on the other hand the air will be heated and expanded; and these two effects may be supposed very nearly, if not exactly, to balance each other. But the experiments alluded to indicate a very decided increase of volume, provided there is a sufficient difference of temperature. If pure transparent steam be mingled with air, previously heated to the same degree, none of this expansion is experienced, and it becomes a question how to compress air in a pump, and convey it in a cold state into a heated cylinder.

Mr. Storms avoids the solution of this difficult problem by allowing the air to mix thoroughly with the steam, at any tempera-

ture it may chance to have, cooling it afterwards by expansion. In other words, he mixes hot or warm air with the steam in the steam-chest, and does not expect the mixture to assume the cloud form until it commences to expand in the cylinder. The act of expanding cools both steam and air, but in very different proportions. Pure steam of a high pressure (say 60 lbs.) has a temperature of about 310° Fahrenheit, and if cut off at half-stroke, so as to double its volume by expansion, cools down to only about 270°; while air at the same temperature, if expanded to the same extent, cools down to about the freezing point. Thus the combined fluids may readily be compelled by expansion to assume the form of cloud or vesicular vapour, if the presence of air at a different temperature be the only condition necessary. To accomplish this object in an ordinary horizontal engine, Mr. Storms has, in the instance above referred to, placed a double-acting air-pump near the cylinder, and allows it to discharge into the steam-chest just above the valve. As the first portion of the stroke of the pump is spent in simply compressing its contents, it is so timed that it will begin to deliver with the commencement of the stroke of the piston. The pump is enveloped in a jacket of cold water to keep it cool, and the air probably enters the steam-chest at a temperature of from 180° to 250°.

A series of experiments has been lately tried at the Novelty Works on a tolerably large scale. The engine was run first with steam alone and then with the cloud combination, the resistance being constant in all cases. The revolutions produced per lb. of coal were as follows: Steam 107, cloud 190; showing a great advantage by the use of the cloud vapour.

HUGHES' BI-SULPHURET OF CARBON ENGINE.

In extracting the following account of Hughes' engine from the same journal, the Committee on Publications of the Franklin Institute, Philadelphia, state that they are assured by a friend in New York, who is competent to form a correct judgment, that the account of the experiments given therein is correct, and that an application is to be made on a scale sufficiently extended to test the practical value of bi-sulphuret of carbon as a motive power:

An engine of small size, analogous to the steam engine in its structure and mode of operation, but producing considerable more power by the employment of a different fluid, the "bi-sulphuret of carbon," has been recently on exhibition in this city. Numerous and varied experiments seem to *furnish indubitable proofs* that this hitherto unimportant fluid (produced in any quantities by passing the vapour of sulphur through charcoal) possesses the long-sought quality of expanding into vapour of a given volume, and thus producing a given amount of mechanical power without the expenditure of as much heat as in generating the same quantity of steam. This is proved by working the engine alternately by steam and bi-sulphuret (taking care to provide against any transfer of heat from one to the other), and observing the power developed in either case with the same fire and the same boiler. The result is uniformly and unequivocally in favour of the new fluid, as worked in this particular engine and under these particular circumstances. A larger engine, rated at six horses power, is reported to have been for some time in operation in a distant portion of the States with the same results; but of this we cannot speak with the same degree of certainty. The engine now exhibiting is in the form of an ordinary horizontal stationary cylinder, 2¼ inches diameter, stroke of piston 4 inches. It is provided with a common short slide-valve like a locomotive, cutting off by the lap at about ⅞ stroke from the commencement. It is accompanied by an upright tubular boiler, heated by a spirit lamp; and the vapour, whether of water or bi-sulphuret of carbon, is finally condensed by passing through a worm or coiled pipe in a vessel of cold water. No vacuum is attained by this condensation, the only object being to preserve the material. Resistance is applied by means of a friction brake, and the feed-pump is provided with cocks, so that either water or bi-sulphuret alone, or a mixture of these fluids, may be forced into the boiler; and it is found that the engine works considerably more rapid, and with a greater load on the brake, when fed with the new fluid than when fed with water. *How much* gain results from this substitution would require more careful experiments and much more time than we have yet devoted to this subject; but the fact of the gain is established beyond a shadow of a doubt. After running for a reasonable time with increased power by the aid of the bi-sulphuret, the engine can be again worked with steam at the same rate as before without interruption of its motion, showing that the operation has been conducted without loss of the heat previously stored in the water. The bi-sulphuret being decidedly more volatile than water, much care is required to treasure the heat to this extent while working with the new fluid; but it was unequivocally done in one instance at our request.

A fluid which expands into vapour with smaller consumption of heat than water has long been sought after as a motive agent. After water or any other fluid has been

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heated to its boiling point, it requires a great addition of heat to expand it into vapour. Alcohol, ether, and other liquids expand into vapour of a greater or less volume than water, and absorb, in so doing, a proportionally greater or less quantum of heat, so that it has come to be acknowledged as a law that the volume of any vapour is proportional to the heat absorbed, and consequently that no gain could be derived from substituting other liquids for water. Two fluids have been proved, however, to be exceptions to this rule. These are mercury and carbonic acid. Both these are or might possibly be more economical of fuel than water for an engine, but both have proved impracticable; the first by reason of the high temperature required (boiling at 620° Fah.), and its effects on the health of those employed about it; the second by reason of the low temperature and great pressure required for its condensation, (boiling at a temperature below zero), as well as by its effects on the metals of the engine and boiler. The present discovery, on the contrary, provides an agent boiling at 108° Fah., and capable of developing possibly a five or six-fold power, as compared with steam, with no practical difficulties yet discoverable, except an unpleasant but harmless odour when allowed to evaporate in the air.

To prevent confusion, it may be well to distinguish between this principle and some of the other hopeful devices for economizing fuel. The caloric or air-engines of Sterling, Ericsson, Wilcox, Bennett, and others, do not attempt this method, but simply draw from the discharging-pipe as large a quantity of its heat as possible, and transfer it to the receiving-pipe. The compound engine of Du Trembley exhibited at the Novelty Iron Works, in this city, in 1852, and now running a French steamer on the Mediterranean, does not attempt this method, but extracts sufficient heat from the exhaust-pipe of the steam-engine to boil the ether at lower temperature, and thus impel a second engine. The cloud-engine of Storms does not attempt this plan, but by introducing air into the steam creates a fluid which operates more desirably than steam *after the "cut-off."* In engineering language, it is only more economical "when worked very expensively." The vapour of bi-sulphuret of carbon has not yet been tested at any high grade of expansion; but should it be found by experiment to follow the same law as steam, the practical value of the fluid for this purpose seems to be almost incalculable.

BOYDELL'S PATENT ENDLESS RAILWAY.

Mr. Boydell, of the firm of Boydell and Glasier, Camden Works, London, has brought forward an invention which excited considerable attention at the recent Carlisle Meeting of the Royal Agricultural Society of England. It consists in attaching to the wheels of a vehicle a number of shoes or sleepers, on which are fixed short lengths of iron rail, so that as the vehicle advances, these portions of rail are successively brought beneath the wheel, and thus virtually form an endless railway on which the carriage runs, the connection between the wheel and each shoe or sleeper being of such a character, that the action is the same as if the two were altogether independent of each other for the time that the wheel is traversing the rail. The length of the shoes or sleepers of course depends upon the size of the wheel, and the number of them is generally about five to each wheel.

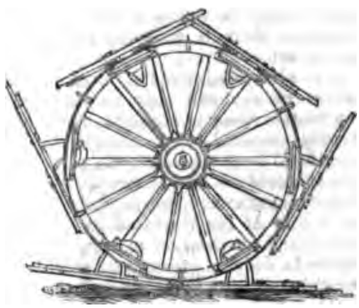
It is plain, that vehicles fitted with this endless railway can only be used where slow motion alone is requisite, for were the velocity acquired very considerable, the centrifugal force applied to the parts of the railway would produce certain derangement. This circumstance, however, does not affect the utility of the invention as applied to agricultural purposes, or to many other operations in which a greater rate than four or five miles an hour is not requisite.

Mr. Boydell's attention has not, it should be stated, been confined to the simple principle of connecting to the carriage-wheel an endless railway, but rather to the method of applying this principle so as to obtain a practicable and efficient arrangement of the parts. The method adopted by him will be understood from the accompanying engraving and the following description, the latter being taken from the *Mark-lane Express*:

"A strong bar of iron is bent into the form of a very sharp-pointed or Gothic arch, and bolted to the sleeper with four strong bolts. At the top of the arch or bar will be observed a strong pivot, analogous to that of the beam of a large balance. This bar works in a strong iron box, curved at the top, and having a groove at each side of the curve in which the pivot works when raising or lowering the railway from and to the ground. The curve of the two sides of the arch is cycloidal, always corresponding to the diameter of the wheel; in other words, the curve which each side of the bent bar forms, supposing it a line, is an arch of a cycloid formed by a point in the circumference of the wheel, in ascending and descending from and to the ground; and the length of

each arch is such, that when the two bottom sleepers are suspended freely from their respective pivots, their rails will form tangents to the point where the line of direction of gravity of the wheel intersects the circumference, supposing the wheel elevated on a jack, or the point of impact. The box again in which these cycloidal bars work is bolted to the felloes parallel to the tire of the wheel, and equidistant from each other.

"The sleepers are considerably longer than the rails, projecting beyond them at each end on the alternate sides, forming a joint analogous to that of ship-building; so that, although the ends of the rails meet at the point of impact immediately under the wheel, yet the back and exterior projection, or *heel*, of the front sleeper extends behind this point; while the front and interior projection of the back sleeper extends before it,



thus forming a sleeper or bearing to the point of impact itself, which otherwise would be without. Such sleepers may be of any breadth; such, for instance, as to support a loaded cart through newly-ploughed land, if desired; or say, from 6 to 15 inches, and are attached to the outside of the felloes by mechanical contrivances not so easily described."

That a great saving in horse or steam power may be effected by the adoption of a contrivance like the above is incontestibly true, and although the apparatus is of a somewhat cumbrous character, and expensive in its first cost, yet there can be little doubt that there are many classes of circumstances in which it will prove invaluable. Judging from a number of experiments which we attended a few weeks since, at the works of Messrs. Boydell and Glasier, we are inclined to believe that, when prejudices are overcome, the arrangement will be extensively adopted by our agriculturalists.

NASMYTH'S MONSTER GUN:

THE CRYSTALLISING EFFECTS OF HAMMERING AND VIBRATION UPON IRON.

BY PROFESSOR NOAD.

NASMYTH's gun is said to be a failure, the reason assigned being the molecular change which the iron has undergone by being kept so long in an incandescent and soft state. Most scientific persons are well aware of this remarkable peculiarity of iron, and not a few of the lamentable accidents arising from the breaking of chains, of axle-trees, and sometimes even from the breaking down of iron bridges may probably be traced to this cause.

The tendency of iron to pass from the fibrous or tough to the crystalline or brittle condition is promoted by various causes; everything, in fact, which occasions a vibration among its particles has this tendency, and I believe that this property is by no means sufficiently kept in view at the present time, when we find on all sides gigantic iron railway bridges springing up, and when the lives of hundreds of individuals are being daily committed to the safe keeping of iron chains in our mines and coalpits. My attention has lately been drawn to this subject, and while on a visit last week to an ironwork in Wales I made the following experiment:—Seeing a large quantity of iron chain lying about, and learning that, though scarcely worn, it had been laid aside in consequence of the breaking of some of the links, I examined several from different parts of the chain. I found that a single smart blow with a hammer was sufficient to snap the metal, the fracture of which was crystalline, and its brittleness such that it could, without difficulty, be broken into small pieces under the hammer. I now heated strongly in a forge some of the broken links, and allowed them to cool very slowly underneath a bed of fine sand. After the lapse of twenty-four hours they were examined; the metal was found to have recovered its tenacity, it could no longer be broken to pieces under the hammer, and when at length, after repeated heavy blows, it did partially yield, the texture of the metal was found to be perfectly fibrous—every trace of a crystalline structure had disappeared. This fact proved that the metal was good, and there can be little doubt that the crystalline texture of the unheated links had been produced gradually by the mechanical action (vibration) to which the chain had been subjected during its use.

Now, in the case of Nasmyth's monster gun, the brittleness of the metal has been occasioned not probably so much from its

having been kept for a long time in an "incandescent and soft state" as from its having, while in that condition, been subjected to violent and long-continued hammering. I would suggest, therefore, as an experiment well worth trying, that the gun should, after it is finished, be submitted to a careful annealing process,—viz, that it should be exposed to a very high temperature, and then allowed to cool as slowly as possible; by this I anticipate that the fibrous texture of the metal would be restored, and its tenacity consequently regained. I need scarcely point out the application of the above remarks to the probable condition of the metal in wrought iron bridges. The iron must, of course, have been subjected to violent percussions during the erection of the bridge, and every locomotive, with its long rattling line of carriages, that subsequently passes over it, must contribute a certain share in the induction of a crystalline state among the particles of the metal, and I cannot see how the inference is to be avoided that by such an arrangement of the molecules the strength of the fabric must be gradually deteriorated.

THE PARIS UNIVERSAL EXHIBITION.

It is very important that the Paris Exhibition should be subjected to a calmer and more extended scrutiny than was possible amid the bustle and excitement of the recent Royal visit. We cannot hope to distil from such a mass of material, and present in an available form to the public, all the lessons that it teaches, but at least some of the broad outlines of the truths to be deduced from it may be traced out, some of its most striking novelties indicated, the light which it casts upon the future progress of industry set forth, and the contrasts of rival arts and manufactures which it most prominently illustrates brought clearly into view.

These periodical gatherings of the products of human labour in the different countries of the world do indeed possess an extraordinary attractiveness in the mere splendour of the spectacle which they furnish; but, to those who study them aright, they will be mainly worthy of interest as so many fresh points from which the progress of industry may be measured, and by which the peaceful energies of mankind may be most advantageously guided and controlled. They have thus two important general bearings—the one retrospective, the other prospective, and to a brief consideration of the present exhibition in both these respects we now invite attention. At a meeting of the British jurors, held some time ago, they made a public declaration of their unanimous opinion that the Paris Exhibition develops a marked improvement in all its departments over that of 1851. They expressed in comprehensive terms their satisfaction at the evidences here collected of a progress in which the material interests of the world are bound up. In the abundance of such evidences rests the success of the Exhibition, and, with the view of placing that success in as clear a light as possible, we shall endeavour to point out wherein this display chiefly excels that of Hyde-park. First, then, is to be noted the great diminution in the bulk of objects unworthy the space which they occupy in such collections. Whatever is exhibited without some specific merit to recommend it is so much cumbersome trash, detracting from the high character of these competitive displays, and which therefore it is most desirable to shoot out of the way as rubbish. In Hyde-park there was a very large quantity of such material, and unfortunately it was distressingly prominent in the British department; for, having had no previous experience in undertakings of the kind, a careful and well selected display of our industrial resources was not practicable. Most people will remember the number of worthless models which filled the galleries of the old Crystal Palace, the vulgarly designed specimens of furniture which obtruded into the nave, and the frequent appearance of articles more appropriate to a museum than to a collection of the kind. In the Paris Exhibition there is, upon the whole, a very striking improvement in this respect, the utility and merit of the varied contents being well sustained, and the reputation of British manufactures especially being placed, by the refining process of selection through which they have passed, in a very favourable point of view. What is shown of an inferior and unworthy character comes mainly from France itself; but to do our neighbours simple justice, the proportion of their display which is open to adverse or disparaging criticism is not at all so large as might be expected.

With the classification of objects in Hyde Park, and the advantages derived from having the entire display collected under one roof, the Paris Exhibition cannot compete. It does not produce upon the mind of the visitor that overwhelming impression of one great design wonderfully elaborated into all its details,—the unities of the undertaking are not so grandly preserved, and therefore, to the superficial observer, an idea of general inferiority may be suggested; but, when the vast mass of objects here gathered together is closely examined, their superiority, as compared with things of the same class shown in 1851, becomes manifest. It is obvious that in the production of them

higher efforts of skill and taste have been exercised, and that a great forward step has been made in every branch of industry. Some countries appear to have advanced most in one direction, and some in another; but the general progress is completely established, and amply confirms the declared opinion of the British jurors on the subject. It will be interesting, therefore, to trace a few of the leading characteristics of this progress, the more especially as the survey may perhaps enable us to form some estimate as to the rate at which the tide of peaceful improvement is running, and the direction in which its main currents are tending. Let us begin with France. Certainly the most remarkable feature of the French department is the show in machinery of every description. We do not say that this display at all touches the British standard of excellence, nor would it be difficult to point out many examples of defective workmanship and bad design; but what astonishes one is the magnitude and variety of the Exhibition, and the striking evidence which it affords of the efforts our neighbours are making to supplement their labour-power by mechanical aid. Whether it be for the manufacture of textile fabrics, or for working in iron, stone, or wood, or for application to special branches of industry, such as paper-making, or for the production of what we in England call "Manchester tools," in every direction the French machinists are treading swiftly and vigorously upon our heels, copying—not always unsuccessfully—our best methods, and inventing for themselves as they advance. Of course, in all the splendid varieties of industry which the trades of Paris, of Lyons, of St. Etienne, and of Mulhausen embrace, a prodigious display has been made; but that was to be expected: nor need the spectator be surprised to find the great national establishments occupying a commanding space, and the principle of governmental interference and encouragement frequently and conspicuously illustrated. There is one example of this which possesses a peculiar interest, and which deserves to be included among the most remarkable features of the present Exhibition. The Minister of War exhibits a splendid collection of Algerine products, including a show of agricultural and mineral wealth which makes one hope that the colony may soon be handed over to a department better calculated to develope its resources than one governing by the sword.

Now, let us endeavour to point out the leading characteristics of progress, as illustrated in the British department of the Exhibition. We do not make a very great *display in machinery*, nor, with one or two exceptions, such as Siemens' engine, is there much of what is exhibited that is new, although what is shown is excellent of its kind. There are several important branches of production in machinery which are hardly at all represented, and among these may be mentioned marine steam engines as a conspicuous omission. No doubt this is in a great measure due to the preoccupation of our principal makers by Government orders, but it deserves to be noted as a singular characteristic of the British department, that it is comparatively weak and deficient where one might have expected it to be strongest. Not that there has been any falling off, or even want of progress among our mechanics since 1851; for, on the contrary, they have made manifest advances, if not in novelties, at least in perfection of workmanship and in the simplification of details. On the other hand, the influence of the Exhibition in Hyde-park is powerfully developed in the improved character of all our manufactures which involve the application of ornament. In furniture, in pottery, in the patterns of our textile fabrics throughout all their ramifications, and even in our metal work, this is particularly remarkable. It is at once surprising and gratifying to see how much good taste, combined with admirable workmanship, the British collection contains; and, although there are some important blanks left unfilled in the circle of industry which the great trades of the country embrace, still it cannot be doubted that, during the four years which have elapsed since 1851, we have been turning to the best account those important lessons which our own Exhibition taught us. But, if we have profited much, our colonies have done so still more; and, while the parent State engages in these peaceful rivalries with the composure which belongs to mature years and experience, it is interesting to watch the eagerness with which her young and half-fledged dependencies descend into the same arena. So remarkably do Canada and the Australian provinces especially vindicate their industrial character and productive resources, that it seems very questionable whether England has not better grounds for pluming herself upon their triumphs than upon her own. She cannot make much show, in a foreign Exhibition, of her coal, her iron, her factories, her fleets of ships and steamers; but she can fairly challenge all the other nations of the earth to produce so healthy and vigorous an offspring as she exhibits in Paris. Except in that way, and from the characteristic collection of the East India Company, it is not possible to collect a proper appreciation of the share which England takes in this great display. She sets her useful manufactures

against the more elaborate productions of French industry, the fruits of untrammelled private enterprise against the costly triumphs of Sèvres and Gobelin—the wealth of self-governed colonies against the most brilliant results of centralization, and, as an exceptional feature in her political system, India against Algeria. One other point is worthy of notice in the British Exhibition, not only as contrasted with France, but with all the other European countries which have contributed to this collection. It is that our manufacturers have, for the most part, taken their stand upon the merits of what they turn out in the ordinary course of trade, whereas the competition which they encounter is one largely founded upon special and extraordinary efforts. In machinery this is particularly obvious, as may be observed from the hand labour expended by the continental makers upon parts which our people finish from the tool, or do not touch after casting. The Austrian, Prussian, and other German States make interesting displays in which the influence of their experiences and observation in 1851 is not doubtfully discernible. Some remarkable examples may be given of this. For instance, if we are not misinformed, a Prussian manufacturer carries off from all competitors the prize for the best finished locomotive. Again, Krupp's display of cast steel, which was so much admired in Hyde-park, has been carried to a far greater pitch of excellence here; and, though not guided by that strict reference to commercial utility which we in England consider indispensable, is, nevertheless, a thing by itself, which no other country can approach. Take, again, Austria. Mr. Cobden's constituents of the West Riding will learn, with astonishment, that the power which their representative has so often talked of with contempt, produces at the Paris Exhibition woollen cloth, better in quality and cheaper in price than theirs; that they must bestir themselves actively in improving their machinery and eschewing shoddy, if they would escape the disgrace of being beaten out of the markets of the world by such rivals. To a Viennese invention, also, we owe the discovery of a method for transmitting two messages along a telegraphic wire in opposite directions at the same moment. Other illustrations might be given of the progress which the German States have made since 1851, but these will suffice for the moment. From the Scandinavian States come small but valuable contributions; among them two machines, which are said to work satisfactorily, and the importance of which, if this be the case, it is hardly possible to over-estimate. One is the realization of the long-talked of calculating machine, by a Swede; the other, a composing and distributing machine, shown, if we mistake not, in Hyde Park by a Dane, and now perfected. Of the remaining countries represented in the Paris Exhibition it is unnecessary for our immediate object to say more than that they each contribute somewhat to the progressive improvement which is so agreeably manifested here. As an international display, the collection is not so complete in all respects as that of 1851, and its shortcomings herein are rendered the more obvious by a plan of distribution which has split up the contributions of each State into several parts, placed at a distance from each other. But, though the attractiveness of the Exhibition is thus seriously injured, its intrinsic value and instructiveness are not sensibly diminished, except, perhaps, in one case. That exception is the United States. Why our cousins have not come out more strongly at Paris, is one of those mysteries which it is much more easy to ask questions about than to explain. One would have fancied that they would have seized with avidity upon the opportunity of implanting in the polite bosom of the French capital a taste for Yankee "notions;" but nothing of the sort. The Republican Eagle courts no intimacy with the Imperial bird, and Jonathan has mainly confined himself on this occasion to "licking" the mother country in reapers and threshing-machines. He also makes some display of his favourite India-rubber goods and his scarcely less prized revolver. He exhibits a machine for cutting out patterns in cloth by steam, and in sewing-machines he makes a display calculated to "rile" all the tailors and sempstresses in Europe. With these and a few other contributions his interest in the Paris Exhibition terminates.

It will be gathered from what we have said, that this Exhibition, while it illustrates the progress which has been made in industry during a period of four years, has not so clearly defined a world-wide character as ours; that it does not so completely gather into one focus the products of the industry of all nations; and that within it we cannot find bodied forth in the same vivid manner those distinctive peculiarities which the different races and families of man, according to the geographical position they occupy, impress upon their manufactures. Such an Exhibition was alone practicable in the home of Free Trade, in the one country the commercial sympathies of which acknowledged no fiscal bonds, and were extended with equal impartiality to all. The political state of the world, too, favoured its realization, and, beyond these influences, investing them with a new and

indefinable charm, lay the enthusiasm of a great community for those peaceful arts by which, under the blessing of Providence, it has risen to the position which it now occupies among the nations. France is differently situated. She retains her protective system, thus closing up many avenues by which other countries would be disposed to cultivate with her relations founded on mutual benefits. Her ideas of material development appeal to State interference and support, rather than to the vivifying principle of private enterprise. She is proud of her establishments, maintained at the public cost, irrespective of their remunerative character, to promote certain favoured branches of manufactures. She pits their superb productions proudly in an unequal rivalry with what, in the ordinary course of business, unpretending individuals can accomplish. The herald of intellectual progress, the propagandist of fashion, the umpire of taste throughout the world, in spite of her adverse commercial system, in spite of a great war which she has on hand, in spite of the disadvantageous terms on which she invites competition, the nations listen to and take up her challenge. The march of improvement is indicated by no wavering or doubtful traces at her gathering, and the specialties of her industrial life assume a meteoric splendour; but we feel that the sublime sentiment of universality is not complete, that there are guests absent whose places would have been occupied had they been made properly welcome, that the characteristics of national industries are imperfectly brought out, and that, under the pressure of a vicious organization within the State, the strict objects of an Industrial Exhibition are more or less departed from.—*Times.*

WORKING STEAM EXPANSIVELY IN TRUNK ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—In perusing the pages of your Periodical for last month, I have been interested in the report of a paper recently read by Mr. E. E. Allen, of London, before the Society of Engineers at Birmingham; in which the author suggests the propriety of admitting the same steam alternately in each side of the piston of an engine working on the trunk principle, thereby to develope the expansive properties of the steam by two operations; thus accomplishing in one cylinder what it requires two to effect it with on the Woolf and other class of engine. In my present trespass on your pages, I beg permission to inform your readers, to whom this idea may appear new, that I obtained a patent on April 28, 1855, for this invention, with various other modifications, which are all either applicable to the single cylinder engine, or those with more than one cylinder.

In my improvements in steam and other motive power engines, the elastic medium is caused to operate "twice in the same cylinder," by being first admitted at a high pressure upon the annular area of the trunk-side of the piston, and afterwards upon the opposite side, which is of a much greater effective area; here its expansion is completed before being finally condensed in the usual manner, or set free into the atmosphere. The tendency that the connecting-rod is known to have when vibrating inside a trunk or hollow ram, to produce a lateral pressure upon the cylinder, is here anticipated, as will be seen from the annexed sketch, fig. 1. In this example the trunk is contrived of a convenient size, projecting from the opposite side of the piston to that on which the steam is first admitted, and the connecting-rod vibrates. Such trunk or ram is caused to slide inside a suitable guide or closed chamber in the end of the cylinder, in such a manner that the steam can operate on the effective area of such trunk or ram simultaneous with the area which is remaining of that side of the piston. Thus the latter is guided and supported on both sides against the oblique pressure of the connecting-rod, while the total surface of one of its sides is not thereby lessened, upon which the steam acts on its second entrance into the cylinder. This is accomplished, as will be seen in section, through A B, in one of various ways, by constructing the cross sectional area of the smaller ram of a different form to that of the closed chamber in which it slides, and by which it is guided, so as to allow the steam to pass freely from the cylinder into the vacant space between the two. The sides of the chamber or hollow guide can also be made adjustable, so as to compensate for the wear, in lieu of the ram or plunger rubbing against the actual sides themselves. In a single cylinder-condensing engine thus working high-pressure steam twice over in the same cylinder, and afterwards condensing it, or in those engines having more than one cylinder in which the steam is thus worked twice over, I compensate for the inequality of pressure which would otherwise be felt on the piston, in the two directions of its motion, from the united effect of the steam and vacuum, by making the trunk a ram on that side of the piston upon which the steam first acts—to work steam-tight in a closed chamber, on end of cylinder, as in fig. 3—the inside of such chamber being kept open by the pipe, F, to

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the condenser, so as to maintain a constant vacuum inside the same. Thus it will be seen, that by properly proportioning the three different areas upon which the steam and vacuum operates, their united impulse upon the piston can be made to develope an equal amount of power in each direction of its path for any amount of expansion required There are further advantages thereby effected which I need not stop to mention here, but which will be apparent to those conversant with this class of engine.

In fig. 2, it will be observed that in an engine, when it is deemed expedient to re-

Fig. 1. Fig. 3.

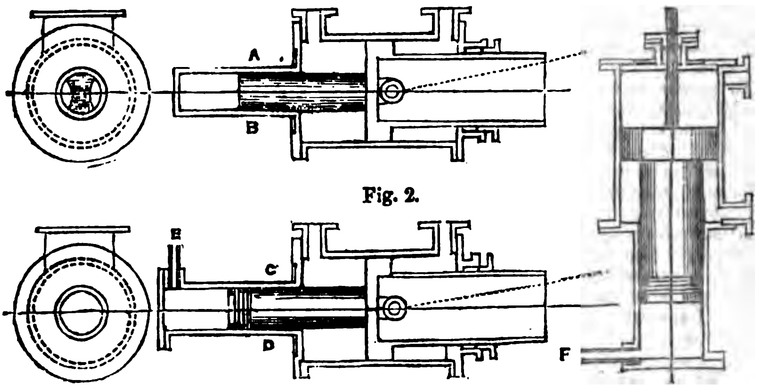

Fig. 2.

tain the open-ended trunk for the facilities it affords for the attachment of the connecting-rod, the ram or trunk, on the opposite side of the piston which it serves to guide, can be constructed to work steam-tight into a closed chamber or hollow guide on end of cylinder, into which high-pressure steam from the boiler or steam chest is constantly maintained by the pipe, E. This is another method, and in some cases a more convenient arrangement, which still effects the same purpose in producing an equal motive power exerted by the piston in each direction of its motion, for any required pressure of steam used.

I trust those of your readers who have followed me thus far, will please to make the proper distinction between the two inventions, and not confound my improvements with those of Sims' engine, which has two cylinders and two pistons; nothing can be more different in operation, yet, their purpose is the same along with Woolf's, McNaught's, and others. I will not trespass further on your space with any tirade on the advantages of my plan over any and every other; I am satisfied to let it bear the brunt of criticism and the better test of practice. My purpose thus far has simply been justice to myself and the public, in placing before your readers a previously existing patented invention to that which is the part subject of the paper to which I have previously alluded. No doubt these modifications which I thus bring forward, or even any modification of the trunk or ram principle as applied to a steam cylinder, to obtain "differential areas," will have practical difficulties, but I fear far worse prejudices to overcome: and though at first sight, my so-called improvements may seem a little like "robbing Peter to pay Paul," a little more intimate knowledge will discover, I trust, some good points at least in assisting to work out the greatest principle which can befriend the steam engine in its arduous task, "that of using high-pressure steam expansively previous to condensation in such a manner as to produce the mos equable motive power with the strongest and simplest number of working parts. There are, I will admit, "practical" objections to overcome in introducing the trunk system, but I am perfectly satisfied that they both are, can, and will most satisfactorily be overcome in the forthcoming reign of high-pressure steam in marine and all other service: and that, too, just as easily and certainly as the metallic piston has long since supplanted hemp packing in the era when steam first began to force its superior way against mere atmospheric vapour, of a not long since former time; neither, I would add, are there any greater difficulties in the way of producing a good metallic steam-tight packing-box, than there was formerly to construct the first metallic piston for a locomotive, which would stand 120 lbs. steam at 800 feet per minute.

I am, Sir, yours, &c.,

E. Carrett.

Sun Foundry, Leeds, Sept. 8, 1855.

THE PROJECTILE CONTROVERSY.

To the Editor of the Mechanics' Magazine.

SIR,—A visit to Paris has for a time taken my attention from the progress of this dispute. I intended to write an answer to the letters of Mr. Hopkins and "Civil Engineer" in your Number of the 1st instant. But the letter of last week from your correspondent "W.," has left me very little to say to them. That little, however, I make haste to say as clearly and succinctly as I am able.

In answer to the closing paragraph of Mr. Hopkins's letter, I must refer him to what I said in my last, as the observations I made there are, in my opinion, peculiarly applicable to what he says of my irrelevancy. He should remember, that a general, and not very liberal attack was made by "Civil Engineer" on the teachings of mathematicians; and the matter in dispute, so far as I am connected with it, is that which appears erroneous to me in the letters of himself and his coadjutor. I am aware that I have done little more than contradict the statements made by these correspondents; but I know also that this was my only course, unless I undertook to attempt to publish in your pages a complete elementary work on this branch of science. The subject of dispute has never been stated clearly by my opponents. I have some difficulty in deciding as to what they really mean. They have both made what, to my mind, are incorrect statements. I have denied them, in the hope that such a course might call forth some attempt to prove their assertions. This has not been so, and therefore I suppose I may draw the natural inference, that they have no grounds which are, in any considerable degree, satisfactory even to themselves. To the rest of this letter, I think he will find an answer in that of "W."

I must now proceed to the letter of "Civil Engineer," beginning with his second paragraph. Does he not perceive that I have questioned the supposed fact that mathematicians hold the theory about which he speaks in any esteem whatever as a solution of the actual problem of the projectile? If he does perceive this, his course should be to bring me some expressions of this esteem from the pens of a considerable number of mathematicians of acknowledged eminence, and not to re-assert his still unproved proposition. The facts brought forward in the fourth, fifth, sixth, and seventh paragraphs of this letter are almost all of them well known to ordinary human intelligence as early as its possessor can play at the ordinary games of childhood. "Civil Engineer," it appears to me, must have introduced them here by way of joke. It is quite incredible, in my judgment, that any adult should seriously suppose that men with the smallest mental powers, and the slightest mental training, could possibly overlook such elementary facts. Of course, these simple facts are just the principal foundation and proof of those laws against which "Civil Engineer" is blindly combating. They have hitherto been regarded as confirming the laws of motion, because it is only by assuming the truth of those laws that these facts can be accounted for. "Civil Engineer" has presented them as if there were a self-evident inconsistency between them and the beliefs of mathematicians. His intention must be facetious.

In the last paragraph but one, your correspondent says, speaking of the motion of a projectile moving obliquely in a resisting medium, "There are no difficulties whatever attending the problem, provided we first determine the amount of resistance presented by the medium, and make our parallelograms accordingly." If this means anything, it is a bold assertion. I suppose it will be utterly useless for me to invite "Civil Engineer" to favour your readers with the exact manner in which this problem, which mathematicians regard as so difficult, can be solved with such facility. Let him take a supposed case, or represent the circumstances by ordinary symbols, if he pleases. I should be delighted to see a solution of a problem that has occupied so much of my attention as this of resistances. I cannot help thinking that "Civil Engineer" is still joking, when he ascribes to mathematicians the hypothesis that projectiles move through equal spaces in equal times. A supposition so inconsistent with well-known facts, of course could hardly be consistent with sanity. I am, Sir, &c.,

A MECHANIC.

To the Editor of the Mechanics' Magazine.

SIR,—I was glad to see Mr. Evan Hopkins, *in propriâ personâ*, in your columns. I have no intention of interfering in his arguments; their weight will soon crush his opponents to powder, if they continue as at present, contradicting, undermining, and mistaking their own propositions. But, by-and-bye, if no one else attacks it, I contemplate annihilating the first law of motion quoted by W. This assumed law lies at the root of the whole controversy. It is a known effect of certain conditions, but entirely false as an abstract law. Mistaking this effect for a cause, an act of obedience for an act of command, a confined particular has been ex-generalized to a law, because such a law has been absolutely necessary to maintain that wild basis of the planetary orbitual motions, which assumes

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them to be *projected bodies*. A mathematician on a distant hill, watching, with a telescope, a railway train, and the periods of its transit at regular intervals, the station master keeping time, and the stokers keeping steam, might calculate, to a nicety, its laws of motion, on the assumption that the train was originally a projected body describing equal spaces in equal times, though quite in ignorance all the while of the real moving power. He might think that, as a learned man, he could hold the stoker up to ridicule, for denying the validity of his theories, and refusing to act upon them. But the real ridicule would be directed by the smiling stoker, who knew the real force he was wielding, and found amusement in the learned labours which were based on ignorance and a prejudiced mistake of facts. It is equally impossible that a railway train should travel for ever to and fro, by one first effect of projection in one direction, and that the planets should travel round and round on *re-entering* orbits, by one original impulse in a right line. Not even the rifle which was crooked to shoot round corners succeeded.

Mr. Hopkins is, I believe, the first person to point out the astounding fact, that the observations are in error on which Kepler's first law, and consequently his second law, two of the bases of the Newtonian theory, depend. An error which has been continued and handed through all authorities. There is a splendid mural circle at Greenwich, and up to the latest date the observations taken by it, record that the diameter of the sun ever decreases from December to June, and equally increases from June to December; and it was upon this observation of a varying magnitude that Kepler based his first law of the elliptic orbits of the planets. Now even the merest tyro in astronomy has been told, that the great sized moon or sun, which shines near the horizon, is magnified by the greater density and thickness in that position of the atmospheric lens through which the rays are passing. It appears to have occurred to no astronomer except Mr. Hopkins, to apply this well-known law to the apparent diameter of the sun at different altitudes in different seasons of the year, and which teaches us at once that measures of the disc taken at noon at Midsummer must of necessity be smaller than measures taken at noon at Christmas, solely because the meridian is then more distant from the horizon, and not by any means because the earth is in apogee of an elliptical orbit. A series of accurate observations at the tropics accordingly proved to him that the diameter of the nearly vertical sun was never sensibly varied from summer to winter. Correct observation thus annihilates Kepler's first law of orbitual ellipses with the sun in the foci. His second law, which requires that velocity accelerates towards the perigee, to bring the elliptical theory to accord with the fact that the radii sweeps out equal areas in equal times, and which is inseparable from *uniform motion in a circle*, fall with it, for the apparent variation of the sun's longitude is equally occasioned by the refraction.

I do not at this moment remember how the astronomers have dealt with the consequences of this variation in the orbitual velocity—such as the necessity for increased rapidity in the earth's rotation as well as revolution in the perigee section of the orbit, to preserve the equal number of days between the equinoxes, and which also involves the necessity of a faster revolution of the moon in winter than in summer, that her orbit may also keep time;—but meanwhile it is certain that the oversight of the variations from atmospheric refraction, in taking the same diameter at different altitudes, and the mass of laborious calculations which have been built upon this oversight, form some of the most surprising errors in the annals of philosophy. It is almost equally surprising that, after such a long oversight, it should have been seen into at last. Kepler's third law and base of the Newtonian philosophy remains unshaken to *its proper extent;* it repeats the law of that great force of central attraction which undoubtedly gives our system its stability, but is perverted out of its sphere, when endued with double and contrary offices, imparting mobility as well as stability at the same moment. That a force acting from the centre of a circle in the direction of the radius should import motion in the direction of the tangent, is a physical impossibility. The attempt to *force* this impossibility into a fact is the root of the accumulated contradictions under controversy. It having been *assumed* that the heavenly bodies are *projectiles* obeying *impossible laws*, the attempt is made to explain the flight of real projectiles by these impossible laws. Celestial impossibilities are used to perplex terrestrial facts, instead of applying terrestrial possibilities to elucidate celestial phenomena. Drop the impossible cause of orbitual motion, and seek after a possible cause, and mathematicians will be disencumbered of half their difficulties; they may then proceed with tenfold success in the calculation of their quantities. The perturbations from which the discovery of Neptune was predicted depended on the known attraction of masses of matter; the calculations were not in the least degree affected by the false hypothesis upon the *cause* of their *constant* motion. This is one thing; the influences to which they are

subjected during that motion are quite another thing, and they must not be confounded. There is an absolute existing force which causes the planets in their orbits to describe equal spaces in equal times; but this force is perturbed by the mutual action of their respective masses.

So far as mere *theory* goes, the result may be indifferent whether we attribute the active motion to the impossible hypothesis of a projectile which manages never to become exhausted, or to the consistent and absolutely necessary action of a true and continuing *vis viva;* but when that false theory is brought down into our own practice, and mixed up with physical realities, the greatest hindrance and confusion arises in the progress of useful truth. The mathematician on the hill must learn and admit the true moving cause in the train; it will not exclude his calculations; but the attempt to supersede the real engine by his engines would prove a serious affair.

I have to thank Mr. Wilkinson for his reply, which is not, however, so satisfactorily clear as I could have wished. The charge against us of confounding two very distinct things is precisely that from which we consider ourselves exempt, and fancy it is due to the other side. I doubt if it is more *reading* that is required. There has already been too much reading, if the works read are inaccurate; the cure must lie in more correct thinking. I have read Newton as well as La Grange, and could give my differential notions, but must now recognize the doctrine of limits in your space. The dictum of the professor quoted by W., and the highly curious discussion in last week's *Notæ*, are fresh instances that the professors of the exact sciences are not always exactly agreed. In truth, mathematics, whether geometrical or algebraic, are a language, and language has always had two uses—the one the expression of truths forcible and important, according to the capacity and the mission of the utterer; the other, an interesting employment to refined and leisurely intellects in speculating on the theory and the graces of its internal construction. W. I will leave to his fate, which he has fully challenged, remarking merely that it is an unfortunate style of argument to attribute to an opponent some intellectual deficiency, and suppose ourselves to be, on the contrary, gifted. This is closing discussion before it begins. To understand the doctrine of limits as far as they are *meant* to be understood, is one thing; to refuse to accept them as an "unlimited authority," is a different thing, quite compatible with perfect understanding. But, above all things, let us avoid a "certain power of mind" called metaphysics, which has been unexceptionably defined, "quand celui qui écoute n'entends rien, et celui qui parle n'entends plus, c'est métaphysique." I am, Sir, yours, &c.,

DAVID MUSHET.

September 5th, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—Your correspondent signed "W." states, in the last number of the Magazine, that "It is no part of the received doctrine of projectiles that *equal spaces* are described in equal times, or that the motion is *uniform.*" Allow me to request your correspondent to refer to the parallelograms in No. 1669, page 107, wherein he will find the propelling sides of the questionable parallelogram made of *equal length.*

If mathematicians have given up that doctrine, how is it that its parallelogram is still preserved in our elementary works? Mr. Hopkins's parallelogram is founded on the data of a *decreasing velocity*, arising from the evanescent character of the projectile force; and I am happy to observe that the context of your correspondent's letter shows very clearly to the reflective mind that the old untenable doctrine of equal spaces in equal times, is no longer esteemed as worthy of notice in a practical and serviceable point of view. I am, Sir, yours, &c.,

CIVIL ENGINEER.

RAILWAY CARRIAGES.

To the Editor of the Mechanics' Magazine.

SIR,—Recent revelations and recent dividends seem likely to curtail railway expenses to a close-shaven economy for some time to come, so that any propositions bearing upon anything but economy are likely to be neglected. But, amid all the improvements in size, proportions, and general arrangements of railway carriages, one point seems almost to be ignored. A deafening rattle is supposed to be a necessity in a second-class carriage, and is but slightly reduced in a first. Conversation is put to a stop, sleep is almost reduced to a nightmare, a fit, and a start, and in cases of daily travel the hearing must be seriously damaged, and the brain unnaturally excited and exhausted by the continuous clatter. Different railways vary in their noise; the laying of the line seems to influence it considerably, as also the wooden interior to the wheels. The Brighton certainly excels in a universal sea-side roar, that tells you at starting whither you are bound. The South-Western and North-Western are decidedly better, and the Great Western and Great Northern may perhaps plume themselves as less noisy than their contemporaries. But if we leave the public railway carriage, and stroll into the official rooms, by secretary's, treasurer's, and

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board-rooms, we shall find every convenience for deadening sound: you tread upon a soft, noiseless substance, seemingly India-rubber and cork combined, which would seem to embody the want we experience elsewhere. A flooring of this material in all carriages, first and second, would answer this purpose; and being clean, durable, and comparatively inexpensive, might readily be adopted. The ordinary sheepskins, or rugs might be placed above, as usual, in first-class carriages, and seconds would not require more than at present, as it is from below the seats that the noise is greatest, and if this be excluded, we should have little to dread. Whatever substance or plan be adopted, the subject is really one of importance; and those persons who are in the habit of travelling to and fro, morning and evening, meeting their friends and acquaintances, must appreciate any plan which would give them not only the opportunity but the practicability of conversation. Should you favour this with insertion, I am, Sir, yours, &c.,

HERBERT C. LLOYD.

Norbiton, Kingston-on-Thames,
September 5th, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WARD, ANDREW HENSHAW, jun., of Massachusetts, United States. *A new and useful or improved loom temple.* (A communication.) Patent dated February 16, 1855. (No. 356.)

This invention consists in employing as a temple a spring hook, formed of a thin plate of metal or steel, having its front end bent downward in the form of a hook, and serrated or provided with sharp teeth somewhat like a comb; also in combining this temple with a certain spring cloth bender.

WRIGHT, JAMES, of Park-street, Kennington, Surrey, oven-builder. *Improvements in the construction of furnaces for the purpose of consuming more effectually than heretofore the smoke contained therein.* Patent dated February 17, 1855. (No. 357.)

This invention consists in the use and adaptation to furnaces generally of a suspended bridge, placed at the underside of a boiler or other vessel, immediately over the furnace bars, and at a suitable distance therefrom, the object being to compel the smoke given off from "green coal" to be thrown down by the bridge, and caused to pass over the clear part of the fire.

OXLEY, JOHN, of Beverley, York, coachbuilder and wheel-manufacturer. *Improvements in machinery for making wheels, or the various parts of which wheels are composed.* Patent dated February 17, 1855. (No. 361.)

Claims.—1. A general construction, arrangement, and combination of machinery or apparatus. 2. A mode of cutting the four parallel sides of the blanks without the necessity of removing them from the machine, by means of circular saws. 3. A mode of cutting or forming tapered tenons on wheel spokes, by means of a rotary cutter or cutters, in combination with a sliding wedge-piece, or sliding inclined table. 4. The application and use of rotary cutters with tools arranged to cut at right angles to each other, for the purpose of forming the shoulders on the tenons of the spokes of wheels. 5. A mode of shaping wheel spokes by means of a rotary cutter working in conjunction with a revolving pattern spoke. 6. The application and use of an expanding gripper for holding the spoke during the process of shaping. 7. A mode of forming either square or round tangs or tenons on the ends of the spokes after they have been driven into the nave.

ROBB, JOHN, timber-merchant, and LAURENCE HILL, shipbuilder, of Greenock, Renfrew. *Improvements in the masts and spars of ships and vessels.* Patent dated February 17, 1855. (No. 362.)

Claim.—Employing a frame or tube of iron for the lower part of a mast, and constructing the upper part of wood. And making the spars of ships and vessels, by using iron tubes for the middle parts, and wood for the two ends.

CHITTENDEN, GEORGE REDFIELD, of London, gentleman. *Improved apparatus for measuring fluids.* (A communication.) Patent dated February 19, 1855. (No. 364.)

This invention mainly consists in constructing a meter, or apparatus for measuring fluids, by packing a piston or its equivalent with any fluid whose specific gravity is lighter than that of the fluid to be measured, in combination with certain chambers, an arrangement of valves, &c.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, in the city of London, patent agent. *Improvements in the manufacture of capsules for stopping or covering bottles, jars, and other similar vessels, and in the machinery employed therein.* (A communication.) Patent dated February 19, 1855. (No. 365.)

This invention consists—1. In the employment of a pressing-plate for holding the blank (from which the capsule is to be formed), and thereby facilitating the stamping of the capsule into shape. 2. In the employment of a compound tubular punch in combination with the pressing-plate. 3. In arrangements for obtaining a double amount of work from a single capsule-making machine, preventing the stopping of the punches, &c. 4. In applying polish and colour to the metal strip or the disc from

which the capsule is to be formed (prior to its being stamped into shape). 5. In making two capsules by the same punch and by one and the same stroke. 6. In manufacturing capsules lined in the inside or coated on the outside, or both lined and coated, by stamping together a blank of some hard metal combined with a blank of some soft metal. 7. In an arrangement for connecting in pairs capsule-making machines provided with successive punches, whereby the manufacture of capsules is simplified and expedited.

TILLETT, GEORGE, of Clapham, Surrey. *Improvements in the construction of bedsteads.* Patent dated February 20, 1855. (No. 366.)

The inventor forms tenons on the ends of the rails of bedsteads, and cuts two slots or mortises in the pillars, at right angles to each other, to receive these tenons, which are so formed that, when one is inserted in the mortise of the pillar, a portion of the tenon on the end of the second rail passes through the former. A bolt on the side of the first rail is then slid through a hole in the end of the second tenon. He also employs certain studs for connecting metallic laths to the rails of bedsteads.

HULETT, DAVID, of Holborn, Middlesex. *Improvements in apparatus for heating, cooking, and lighting by gas.* (Partly a communication.) Patent dated February 20, 1855. (No. 367.)

Claims.—1. Certain improvements in gas stoves, "in which glass forms the principal portion of the stove, whether plain, silvered, or otherwise decorated, for the purpose of reflecting heat, and used in combination with a metallic or wooden frame, and a particular arrangement of the burner to be used with the same." 2. Various mechanical arrangements for raising, lowering, adjusting, and securing pendent lights, chandeliers, and pillars, &c.

MEAD, CHARLES ROPER, of Langdale-road, Peckham, Surrey, gas-engineer. *An improved construction of gas regulator.* Patent dated February 20, 1855. (No. 369.)

The inventor claims a general arrangement of parts whereby he purposes regulating the supply of gas to burners according to the requirements of the consumer, without interfering with the steady burning of the gas, and particularly connecting the supply or cut-off valve with a weighted diaphragm, by means of a rocking lever.

SCHOTTLANDER, HENRY, of Paris, France, manufacturer. *Improvements in ornamenting looking-glasses.* Patent dated February 20, 1855. (No. 371.)

This invention consists—1. In the application of the well-known method of printing in colours to looking-glasses. 2. In ornamenting glasses "by painting, printing, photography, potichomanie, &c., in connection with silvered glasses."

KERSHAW, SAMUEL, of Heywood, Lancaster, manufacturer, and JAMES TAYLOR, of the same place, manager. *Certain improvements in carding engines.* Patent dated February 20, 1855. (No. 372.)

This invention consists—1. In the employment of fluted or drawing rollers, feeding or "licker-in" rollers, or any substitutes for them, however arranged and applied to carding-engines, for the purpose of "thinning the lap," by giving an extra distension or stretch to the laps therein carded, previously to the lap being delivered on the licker-in roller from the lap roller. 2. In the employment of combs or serrated edges placed between the top rollers and strippers, or any other rollers similarly employed, for the purpose of more equally separating and distending the fibre of the cotton. 3. In the employment of double reciprocating doffing combs or knives, or of a series of revolving knives or combs, for the purpose of facilitating the removal of the carded cotton from the doffing cylinder or roller.

BEAUMONT, FREDERICK BLACKET EDWARD, of Upper Woodball, Barnsley, York, Lieutenant Royal Engineers. *Improvements in fire-arms, called revolvers.* Patent dated February 20, 1855. (No. 374.)

This invention consists of a peculiar combination of the parts of a lock of a fire-arm, by which the hammer may be cocked by hand, or by pulling the trigger. For this purpose the hammer, in place of being separate from, is connected to the trigger, so that when the trigger is moved back the hammer is raised. The trigger has also combined with it similar apparatus to what has heretofore been used in locks of fire-arms for acting on the hammer to put it back (when not cocked) by pulling the trigger, so that a fire-arm will at all times be in a condition (supposing a cap be on the nipple) to be discharged by the trigger, either after first cocking the hammer by hand, or by simply pulling the trigger.

WOTHLY, JEAN, of Zoffingen, Switzerland. *Improvements in the preservation of meat.* Patent dated February 20, 1855. (No. 375.)

In carrying out this invention the meat is cut into pieces of from about ten to twelve pounds weight each, and separated from the bones. These pieces have dusted over them a mixture of sugar and salt, and are allowed to stand for about two days, when they are to be subjected to pressure, in order that all the blood and serous matter may be forced out; or in place of being pressed they are moderately cooked before packing. They are then packed in casks

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lined with melted fat, which is allowed to set on the interior surfaces, greased paper being used to cover the pieces of meat, and melted fat is run into the spaces or interstices between the pieces. This first cask is then closed, and inserted in a larger cask, the space between the two being filled with sand or lime before the outer one is closed.

KIDD, JOSHUA, of Kildwick, near Bradford, York, and of Bradford, stuff manufacturer. *Improvements in machinery and apparatus for sewing and stitching cloth and other fabrics.* Patent dated February 21, 1855. (No. 376.)

This invention consists in the employment of an arrangement of mechanism, by which the chain stitch, and also the double or cross chain stitch may be worked without materially deranging the machine, the apparatus for producing either one of these being adapted to the production of the other, by simply changing the needle or thread carrier.

GOODFELLOW, BENJAMIN, of Hyde, Chester, engineer. *Improvements in machinery for pumping, which improvements are applicable to the air-pumps of steam engines and to other purposes.* Patent dated February 21, 1855. (No. 378.)

This invention consists—1. In the application of a slide valve to the pumping cylinder or barrel of machines for pumping, by which the valves usually required are wholly or in part dispensed with; also in a mode of working such slide valve. 2. In dispensing with the foot and delivery valves, and the valves in the air-pump buckets of condensing steam engines; and in substituting in their stead a slide valve and a double acting piston.

NASMYTH, GEORGE, of Kennington, Surrey, civil engineer. *Improvements in preserving animal and vegetable matters.* Patent dated February 21, 1855. (No. 381.)

This invention consists in the employment of alcohol, or other liquids which vaporize at a temperature below that of boiling water, as a means for discharging the atmospheric air from vessels or cases containing animal or vegetable matters to be preserved.

HEPPEL, GEORGE, of Preston, Lancaster, gentleman. *An improved rotary pump and engine.* (A communication.) Patent dated February 21, 1855. (No. 382.)

Claim.—Constructing rotary pumps and engines with pistons revolving within and around the axis of a circular casing, and caused to approach and recede from each other, by means of links or connecting rods connected to pins or pivots on a circular plate or disc, which revolves in an eccentric recess at one end of the circular casing.

PIDCOCK, JOHN HYDE, of Leighton Buzzard, Beds, civil engineer. *An improved method of propelling and steering vessels, which is also applicable to the forcing and directing of liquids and fluids.* Patent dated February 21, 1855. (No. 384.)

An illustrated description of this invention will shortly be given.

PRINCE, FREDERIC, of South Parade, Chelsea, Middlesex. *Improvements in fire-arms and ordnance.* Patent dated February 21, 1855. (No. 386.)

These improvements principally consist in having a fixed plug, (either conical or cylindrical,) attached to, or formed of one piece with the breech or break off, which is firmly secured to the stock of the fire-arm. The barrel is so mounted as to be capable of sliding to and from the breech, and also of partially turning around its own axis. The plug is provided with two or more segments of a screw, and the barrel is provided with a corresponding number of segments of a female screw opposite to the spaces between the segments upon the plug, so that, (the cartridge having been introduced,) as the barrel is slidden forward on to the plug, the segments of the screw pass each other, but upon giving the barrel a slight turn, (by means of a lever attached thereto for that purpose) the threads of the screw become securely interlocked, and by their action wedge the barrel firmly on to the plug.

NOBLE, GEORGE, of Sunderland. *Improvements in the manufacture of fire-bricks.* Patent dated February 21, 1855. (No. 388.)

This invention consists of a combination of hydraulic machinery for pressing clay in a pulverised state with or without a slight addition of water.

PRINCE, PAUL, of Derby, railway inspector. *An improvement in the patterns employed in making moulds for railway chairs.* Patent dated February 21, 1855. (No. 389.)

This invention consists in making each pattern of a railway chair of two parts connected by a hinge or axis, so that when a mould has been formed on the pattern, one part of the pattern may be caused to move on its axis, and thus admit of the whole being more conveniently taken from the mould.

LOW, CHARLES, of Bodowen, Dolgelly, North Wales, gentleman. *Certain improvements in the extraction of gold from its ores.* Patent dated February 21, 1855. (No. 390.)

A full description of this invention will be given hereafter.

HARRISON, THOMAS, of Hackney, Middlesex, ship-owner. *A composition for cover-*

ing and protecting the bottoms of ships and vessels. Patent dated February 22, 1855. (No. 391.)

The inventor melts, by means of steam, in an iron vessel furnished with a jacket, 35 parts of pitch or rosin, and then adds 35 parts of a preparation of chalk, (made by washing the sand out of the unprepared chalk), afterwards drying and grinding the mixture to a fine powder. The two materials are then well mixed by means of an agitator revolving in the vessel, and the inventor adds carbonate of barytes, in powder, 25 parts, and sulphate of copper, in powder, 5 parts. The whole being well mixed and allowed to cool down to 100° F., as much crude naphtha or spirit of turpentine is added as will make it of a consistence fit to be used with a brush, when the composition is prepared.

NEILSON, WALTER, of Glasgow, engineer. *Improvements in locomotive engines.* Patent dated February 22, 1855. (No. 396.)

Claims.—1. A general arrangement and construction of locomotive engines, as described. 2. A mode of working the link-valve gear of locomotive engines by means of eccentrics carried upon a driving axle situated at the rear of the fire-box of the engine. 3. A mode of arranging and working steam slide-valve details of locomotive engines wherein the actuating eccentrics are disposed at a point between the link movement and the slide-valve, the eccentrics and link being at the rear of the fire-box. 4. A mode of arranging and constructing the boilers of locomotive engines wherein a steam chamber, the transverse section of which is a segment of a cylinder, is attached to the upper side of the boiler, and open thereto, with an intermediate rectilineal stay between the boiler and the chamber.

EAST, FREDERICK WILLIAM, of Bermondsey-street, Southwark, and JOHN MILLS, of William-street, Cobourg-road, Old Kent-road. *Improvements in destroying the noxious vapours arising from boiling oil, bones, and other matters in the open air.* Patent dated February 22, 1855. (No. 397.)

This invention consists in peculiarly arranging the furnaces and flues of a boiler wherein oils, bones, or other matters which give off vapours with noxious odours are boiled, so that by means of a fire, in addition to the one used to heat the boiler, such a draft may be established as to induce currents of air to flow over the boiler, and, together with the vapours arising from the boiler, pass to and through the additional fire.

HARTCLIFFE, WILLIAM, of Salford, Lancaster, machinist, and JOSEPH WATERHOUSE, of Manchester, manager. *Certain improvements in looms for weaving.* Patent dated February 22, 1855. (No. 398.)

This invention consists in producing the letting off or taking up motions of looms by means of the combination of a certain feeding roller, friction roller, disc, &c.

NORTON, JOHN, of Dublin, Ireland, esquire. *Improvements in the construction of cartridges for fire-arms.* Patent dated February 23, 1855. (No. 400.)

This invention consists in the use of fulminating powder or composition as a priming for cartridges, to cause an explosion through the solid or unbroken cartridge case, and in a mode of arranging and constructing cartridges wherein the base of the case is punctured, or otherwise rendered vulnerable to the flame or heat of the nipple percussion fire, for effecting the discharge of the ordinary gunpowder charge.

RANKINE, WILLIAM JOHN MACQUORN, of Saint Vincent-street, Glasgow, civil engineer, and JOHN THOMSON, also of Saint Vincent-street, sub-assistant engineer to the East Indian Railway Company. *Improvements in machinery for laying subaqueous electrical conductors for telegraphic communication.* Patent dated February 23, 1855. (No. 401.)

Claims. — 1. Preventing the successive coils of the cord or cable containing the subaqueous telegraphic conductor or conductors from over-riding each other upon the drum or drums round which they pass, by interposing between the coils on the circumference of each drum a band of steel or other suitable material wrapped spirally round the drum, and so fixed as to remain at rest while the drum rotates. 2. The adaptation to the purpose of guiding and regulating the motion of the cord or cable, of one or more pairs of pulleys having grooves or channels round their circumferences separated by projections or flanches. 3. Lowering the cord or cable into the water directly from a drum or pulley projecting over the stern of the vessel. 4. Controlling the speed of the cord or cable by the adaptation to the purpose of the resistance of fluids forced through narrow orifices by pumps worked by the drums or pulleys round which the cord or cable passes. 5. Abstracting the heat developed by the friction of the cord or cable, and of the machinery or apparatus whereby the same is lowered, by the application to that purpose of water delivered from the pumps adapted to the controlling of the speed of the cord or cable, or from other pumps worked by the machinery or apparatus whereby the cord or cable is lowered. 6. The combination and adaptation of the preceding parts, or some of them, so as to improve the method of laying subaqueous electrical conductors.

ZAHN, WILLIAM HENRY, of Norfolk-

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street, Strand, London. *Certain improvements in wind-mills.* (A communication.) Patent dated February 23, 1855. (No. 402.)

This invention consists in having the wings or sails of wind-mills attached to moveable or rotating spindles having levers connected to them, and being also connected to a head which rotates with the wings or sails upon the same shaft. The head has a lever connected to it which is operated by a governor that slides the head upon the shaft, and causes the levers to turn the wings or sails so as to present a proper resisting surface to the wind.

Gardner, John Edmund, of the firm of H. and J. Gardner, of the Strand, Westminsters, manufacturers. *Improvements in portable cooking-apparatus and in cooking-lamps.* Patent dated February 23, 1855. (No. 404.)

This invention consists of a most ingenious arrangement of all the various utensils required for the processes of boiling, baking, frying, &c., so that they may fit closely into each other, and be very compactly stowed in a leathern or other suitable case, in a very portable form. It also embraces the construction of cooking-lamps of a greatly improved character, which lamps form part of the above-named apparatus.

Looker, Benjamin, junior, of Kingston-upon-Thames, Surrey. *Improvements in ventilating stables and other buildings.* Patent dated February 23, 1855. (No. 406.)

This invention consists of constructing clay, earthenware, or glass tubular apparatus to be let or built into walls, the air being admitted from the exterior of the building into the interior through numerous small openings, which, by preference, are made in a direction inclined back towards the wall.

Thompson, Nathan, junior, of New York. *Improvements in constructing life-boats.* Patent dated February 23, 1855. (No. 407.)

This invention comprises the use of a longitudinal brace or keelson with slots or longitudinal openings, and sliders attached to each end of it; the bringing of the bottom on to such a longitudinal brace or keelson; the use of a swinging brace with seats attached to lock in the sides; and the attachment of waterproof canvas or leather, or other equivalent material, to the joints.

Lebel, Victor Joseph, of Paris, Jean Fourniol, of Paris, printers, and Jean Baptiste Remyon, of Paris, merchant. *Improvements in typographic presses.* Patent dated February 24, 1855. (No. 408.)

This invention mainly consists in the combination or construction of an inking apparatus for typographic presses used for printing in colours. To prevent each of the inking rollers from touching any but the required parts of the "form" during its passage beneath them, they are furnished with a narrow roller or wheel at each end, which enters a corresponding groove at the side of the form. These grooves and the rollers are not all placed in the same line, but each in a different line.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Haughton, Henry Philip, of Bethnal-green, Middlesex, clerk. *Improvements in a certain article of wearing apparel for the ankles.* Application dated February 17, 1855. (No. 358.)

"It has been usual," says the inventor, "to manufacture an article called muffitees to be worn on the wrists; now I propose the manufacture of a somewhat similar article, which may be modified as to material, form, and size, for wearing over the ankles."

Hackett, John, of Derby, in the county of Derby. *The manufacture of a new and improved fabric or fabrics for the manufacture of umbrellas, parasols, and buttons, and for other purposes.* Application dated February 21, 1855. (No. 359.)

The inventor states that he uses fabrics composed of at least two-thirds of the warp, and at least two-thirds of the weft threads of doubled and twisted two-thread cotton, worsted, mohair, &c.

Hackett, John, of Derby, in the county of Derby, manufacturer. *An improved leather cloth, and the employment thereof for various useful purposes.* Application dated February 21, 1855. (No. 360.)

The fabrics consist of—1. At least two-thirds of the warp threads and two-thirds of the weft threads of doubled and twisted cotton; or 2. At least two-thirds of the warp threads of doubled and twisted linen, and two-thirds of the weft threads of doubled and twisted cotton, and *vice versâ*; or 3. Two-thirds of the warp and two-thirds of the weft threads of doubled and twisted linen.

Maryon, Robert James, of York-road, Lambeth, Surrey, mechanician. *An improvement or improvements in the construction of and application of steam engines for the better means of transmitting motion and conversion of motion, and of applying motive power.* Application dated February 17, 1855. (No. 363.)

This invention primarily consists of an improvement effected by the construction of oval coupled or connected pistons, which are intended to act in concert with an action patented by the inventor July 13, 1851.

Bellamy, Samuel, of Torquay, Devon. *Improvements in fire-arms and ordnance.* Application dated February 20, 1855. (No. 368.)

This invention consists in constructing

ordnance and fire-arms with two or more barrels communicating with a fixed breech, for discharging the contents of the barrels simultaneously; or, if necessary, the breech is furnished with plugs which pass across it, so that by turning round one or other of these plugs only one or two of the barrels may discharged, the loading being effected either at the muzzle or at the breech end of the gun.

THIRION, ALBERT LOUIS, of Asche-en-Refail, Namur, Belgium. *Improvements in pumps.* Application dated February 20, 1855. (No. 370.)

The inventor says, "I place several levers circularly, corresponding with an equal number of pumps or pump cylinders, or with a single pump or pump cylinder, set in motion by the weight of a conical roller moving round a fixed centre."

BROWN, JOHN HARCOURT, of Trafalgar-square, Charing-cross. *Improvements in the construction of ball cartridges for facilitating the loading and lubricating of fire-arms.* Application dated February 20, 1855. (No. 373.)

These improvements consist—1. In constructing the bullet so that the lubricating material is placed in a groove compressed or cast in it, so as to form a belt around its cylindrical base. 2. In so forming the cartridge or cup (whether composed of paper or other material) which receives the bullet, that it terminates just above the groove containing the lubricating material.

LAMING, RICHARD, of Carlton-villas, Maida-vale, Middlesex. *An improved process for combining the purification of gas with the obtaining of certain valuable products.* Application dated February 21, 1855. (No. 377.)

This invention consists in combining the following operations:—1. Bringing water, or gas-liquor obtained from the condensers, or other suitable liquid, contained in a purifying vessel or vessels, in contact with a current of impure gas. 2. Saturating the ammonia as it accumulates in the liquid with sulphuric or other desirable acid, introduced to it under a bell or inverted cup, or other equivalent apparatus, (which may be either placed in a purifying vessel, or form part thereof, or be otherwise in communication therewith); and 3. Conveying away from the upper part of the bell or other equivalent apparatus the hydrosulphuric and carbonic acids, by a conduit leading either to a furnace where they may be economically disposed of, or to some other suitable locality.

TELLE, JULIEN AIMABLE, of Paris, France. *A system of railways to be used in the interior of cities and towns.* Application dated February 21, 1855. (No. 379.)

The inventor proposes that railways shall be laid down in cuttings made along streets, or supported at a suitable elevation above the level of the street on a succession of arches, by means of which the smaller crossings are effected, the larger ones, such as main streets, canals, &c., requiring bridges.

NORTON, FREDERICK WILLIAM, of Edinburgh, Midlothian, manufacturer. *Improvements in the manufacture of printed or coloured warp fabrics.* Application dated February 21, 1855. (No. 383.)

This invention relates to the use of the printed warp threads used in the manufacture of tapestry and velvet pile carpets, and by it the accurate setting of the printed threads is facilitated; in carrying it out in practice the warp printer goes to work in the usual manner, and after putting the first thread upon the drum, and before printing that thread, he prints with a dissolved gum resin, or with any other suitable pigment or substance a small line across the thread so wound up, &c., &c.

HACKETT, JOHN, of Derby, manufacturer. *The employment of a new and improved fabric or fabrics for the making or manufacturing either wholly or partially of garments, or part or parts of garments, or for appendages to garments for the purposes of wearing apparel for the use of men, women, and children.* Application dated February 21, 1855. (No. 385.)

This invention consists in the employment of a fabric or fabrics composed of cotton and of linen, and of cotton and linen combined, for the purposes named in the title. "Although I propose," says the inventor, "to use not less than the whole of the warp and weft of double and twisted material, I use two-thirds of the warp and weft simply to prevent persons evading my patent, by inserting a few ends of single threads amongst the doubled and twisted threads."

MAYNES, WILLIAM, of Stockport, Chester, agent. *Certain improvements in self-acting temples to be used in weaving.* Application dated February 21, 1855. (No. 387.)

This invention consists in the division of the roller of the "box and roller" or "trough" arrangement into two or more parts or separate rollers, having such of their pivots as are not carried by the ends of the trough supported in a bearing or bearings at one or more intervals in the length of the temple; or the formation of the said roller in one piece, supported at one or more intermediate points in its length, as well as at its ends, together with an arrangement of rests, bearings, or supports, for carrying the intermediate pivots of the

separate rollers before mentioned, or for supporting the roller, if continuous, at the necessary intervals.

KIRRAGE, WILLIAM, of Edmund-street, Camberwell, Surrey, surveyor. *Consuming or burning smoke.* Application dated February 22, 1855. (No. 392.)

This invention consists in "collecting the exhausted smoke after it has performed its usual functions into a reservoir or retorts, and then conveying the hot air which is produced during the process of consumption into the chimney shaft."

M'CONNELL, ROBERT, of Glasgow, Lanark, bleacher. *Improvements in finishing or dressing textile fabrics.* Application dated February 22, 1855. (No. 393.)

This invention consists in a general arrangement of mechanism by means of which a smoothing iron may be made to operate upon the surface of the fabric in the manner required.

BUNTEN, JAMES, of Glasgow, Lanark, timber merchant, and GEORGE LAMB, of the same place, joiner. *Improvements in cutting and shaping wood.* Application dated February 22, 1855. (No. 394.)

The first part of this invention relates to a mortising machine, and consists chiefly in a contrivance for turning the cutting tool easily without stopping the machine. The second part of it relates to an improved arrangement of mechanical details for cutting tenons upon wood. In these improvements it has been an object to save the wood cut from the sides of the tenon as much as possible, whilst at the same time the pieces cut away are made of uniform thickness to render them more suitable for any purpose to which they may be applied.

CLARKE, PETER, of Manchester, Lancaster, engineer. *Improvements applicable to locomotive steam engines.* (A communication.) Application dated February 22, 1855. (No. 395.)

These improvements mainly consist in encircling the end of the blast pipe or pipes with a short conic tube or cylinder, which is itself encircled by another cylinder, modified to suit the peculiar construction of each engine, and in forming a partition across the smoke-box between the ends of the tubes and the door of the smoke-box.

TAYLOR, ANDREW, of Duke-street, Manchester-square, Middlesex, gentleman. *Self-acting railway signals, and apparatus connected therewith, for improving the means of communication between persons in charge of, and the drivers of trains, and to render collisions less frequent on railways.* Application dated February 23, 1855. (No. 399.)

The inventor proposes the use of certain "catches" which may be placed upon the line of rail in such manner as to strike a lever depending from an approaching engine, and thus act upon the valves, &c.

BENNETT, NICHOLAS, of Furnival's-inn, Holborn, Middlesex, gentleman. *A substitute for the scaffolding at present employed in, and for the erecting and repairing of, buildings, which is also applicable in part to the ventilation of buildings.* (A communication.) Application dated February 23, 1855. (No. 403.)

The inventor employs sockets of metal or other suitable material which he builds in with the brickwork of the building, and disposes at suitable distances asunder for rendering them available for the reception of projecting bracket-pieces for supporting a temporary stage formed of planks laid side by side.

ALLAIRE, SIMON MARTIN, hatter, of Paris, French Empire. *Certain improvements in hats, caps, and bonnets.* Application dated February 23, 1855. (No. 405.)

This invention consists in forming the body of hats, caps, and bonnets of a knitted fabric of cotton, linen, wool, silk, or other material.

PROVISIONAL PROTECTIONS.

Dated August 10, 1855.

1809. Alfred Heaven, of Longsight, near Manchester, embroiderer by machinery. Improvements in machinery for embroidering fabrics.

1811. William Henry Lancaster, of Peach-place, Brownlow-hill, and James Smith, timber merchant, Sefton-street, Toxteth-park, both of Liverpool, Lancaster. Certain improvements in the manufacture of gas for illuminating, heating, and other purposes.

1813. Joseph Betteley, of Liverpool, Lancaster, chain cable manufacturer. Improvements in the manufacture of ships' chain cables.

1815. Edward Finch, of Chepstow. Improvements in machinery for loading and unloading coal and other vessels.

1817. John Lee Stevens, of Fish-street-hill, London, civil engineer. Improvements in steam-boilers.

1819. Pontus Lagergren, chemist, of Stockholm, Sweden. Improvements in paddle-wheels.

1821. Edwin Ullmer and William Ullmer, of Fetter-lane, London, manufacturers. Improvements in machines for cutting paper, card, and millboards, and other like substances.

Dated August 11, 1855.

1825. James Gardner, of Plaistow, Essex, gentleman. Improvements in the manufacture of salt.

1827. Walter Brown, of Catherine-street, Cornwall-road, Lambeth. Improvements in the manufacture of sheet metals, casks, and kegs.

1829. Alexander Cameron Morrison, of Acacia-place, St. John's-wood, Middlesex. An improved compound or mixture for feeding horses and other cattle.

Dated August 13, 1855.

1831. Louis Normandy, of Judd-street, Brunswick-square, Middlesex. A new circular-weaving machine. A communication from Messrs. Florence, Houguet, and Teston, of Nerviers.

1833. Walter Hancock, of Upper Chadwell-street, Pentonville, Middlesex. Improvements in the manufacture of casks, or barrels, or of the linings

of the same, and which improvements are also applicable to other hollow vessels.

1835. Ebenezer Daggett Draper and George Draper, of Massachusetts, United States of America. An improved vessel or can for oiling machinery. A communication.

1837. Thomas Butler, of Willenhall, Staffordshire. Improvements in locks.

Dated August 14, 1855.

1839. Thomas Kempson, of Birmingham, Warwick, engineer. A new or improved steam-engine and boiler.

1841. Gilbert Sanders, of Dublin, Ireland, gas engineer, and Richard Edward Donovan, of Courtduffe, Castleknock, Dublin, Ireland, gentleman. Improvements in maintaining the level of the water or other liquid in gas-meters and steam-boilers, and regulating or controlling the action of such apparatus.

1843. Mark Mellor, of Hyde, Chester, spinning-manager. Certain improvements in self-acting mules.

1845. John Coope Haddan, of Cannon-row, Westminster, civil engineer. Improvements in the manufacture of cannon.

Dated August 16, 1855.

1856. Joachim Hayward Stocqueller, of Regent-street, Middlesex, gentleman, and William James Buchanan Saunders, of Southwark, Surrey, gentleman. Improved mechanical means for obtaining elevations.

1858. Charles Joyner, of Birmingham, Warwick, brassfounder. A new or improved tap or stop-cock for liquids and gases.

1860. Frederick Paget, of Vienna. An improved holder for steel or other pens by which ink is supplied to them. A communication.

1862. John Atherton, of Preston, Lancaster, machine-maker, and William Boyes, of the same place, manufacturer. Improvements in looms for weaving.

1864. William Fawcett and Francis Best Fawcett, of Kidderminster, Worcester. Improvements in the manufacture of carpets and similar fabrics, and in apparatus used therein.

1866. William Maynes, of Stockport, Chester, agent. Certain improvements in self-acting temples to be used in weaving.

Dated August 17, 1855.

1868. Jean Jacques Danduran, of Rue de l'Echiquier, Paris, France, civil engineer. Improvements in diving apparatus.

1870. David Brown, of Smethwick, Stafford, machinist, and Jeremiah Brown, of Kingswinford, Stafford, machinist. New or improved machinery for the manufacture of bayonets.

1872. Thomas Edge, of Great Peter-street, Westminster, gas apparatus manufacturer. An improvement in the manufacture of gas-meters, and other articles for containing and supplying gas.

Dated August 18, 1855.

1874. William Sangster, of Cheapside. An improvement in the manufacture of umbrellas and parasols.

1878. Ferdinand Tavernier, of Paris, France. Improvements in apparatus employed in combing wool and other fibrous substances.

Dated August 20, 1855.

1880. André Dubrulle, of Lille (Nord), France, lamp-manufacturer. Improvements in safety-lamps.

1882. Francis Journeaux, of Mount Shannon Mills, Dublin, merchant. Improvements in drying wheat and other grain.

1884. William Avery, of Smethwick, near Birmingham, Warwick, machinist. A new or improved method of joining or connecting straps or bands used for transmitting motive power.

1886. Pierre Gontier, of Paris, France, chemist. Improvements in treating linseed, poppy, and other oils employed in the mixing of paint.

Dated August 21, 1855.

1888. Robert Longsdon, of Queen-street-place, New Cannon-street, London, architect and civil engineer. Improvements in apparatus to be used for removing property into and out of strong rooms, and in the mode of securing such property from fire or theft.

1892. Carl Ludwig Augustus Meinig, of Piccadilly, and Franz Xaver Kukla, of Raven-row, Mile-end, Middlesex. Improvements in ornamenting surfaces.

1894. Lucius Paige, of Vermont, United States of America. Certain new and useful improvements in brake mechanism for railway-carriages.

1896. Joseph Wormald and George Pollard, of Bridge Foot, Vauxhall, Surrey, engineers. Improvements in ratchet-braces.

Dated August 22, 1855.

1898. Charles Vanden Bergh, gentleman, of Lacken, Belgium. An improvement in the mode of packing pistons of steam and other engines.

1900. William Spence, of Chancery-lane, Middlesex, patent agent. Improvements in machinery for dressing and finishing cloth. A communication from Dominique Beck, of Elbœuf, France, mechanician.

Dated August 23, 1855.

1904. Thomas Eyre Wyche, of Camberwell, Surrey, gentleman. Improvements in propelling vessels.

1906. Charles Claus, of Liverpool, Lancaster, practical chemist. Improvements in removing hairs from hides and skins.

1908. Ernest Parod, of Rue de l'Echiquier, Paris, France, gentleman. Certain improvements in the steering of steam and other vessels.

1910. William Denton, of Addingham, Yorkshire, machine wool-comber. Improvements in drawing wool and other fibrous substances off the combs of combing machines.

1912. William Kidman, of Poplar, Middlesex, shipwright. An improvement in tillers or yokes.

Dated August 24, 1855.

1914. Frederick Scott Archer, of Great Russell-street, Bloomsbury, Middlesex, photographer. Certain improvements in photography.

1916. Henry Frooms, of Manchester, Lancaster, pianoforte manufacturer. Improvements in the manufacture of pianofortes.

1918. Thomas De La Rue, of Bunhill-row, Middlesex. An improvement in printing-inks.

1920. Peter Effertz, of Aix-la-Chapelle, Prussia, engineer. Improvements in machinery for making bricks, tiles, pipes, and other similar articles.

Dated August 25, 1855.

1922. John Avery, of Essex-street, London. Improvements in handles for augers, gimlets, and other tools, and instruments to which such handles may be applicable. A communication.

1924. John Avery, of Essex-street, London. Automatic attachments to be applied to gates and doors. A communication.

1926. William Brown, of Handsworth, Stafford, commercial traveller. Improvements in the manufacture of paper-bags.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1969. John Hope and Thomas Hope, of Rhode Island, United States of America. An improved machine for engraving the surface of a calico printer's roller, preparatory to its being etched. August 31, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September* 11*th*, 1855.)

973. William Eassie. Improvements in machinery or apparatus for stopping or retarding railway-trains.

975. William Hartley. Improvements in safety-valves, and in apparatus connected therewith, applicable also to regulating the flow of steam for other purposes.

978. Lemuel Wellman Wright. Certain improvements in locks.

982. John Scott Lillie. Improvements in tents or other movable habitations.

991. William Rowett. Improvements in fitting, handing, and reefing vessels' sails.

992. John Platt and James Taylor. Improvements in looms for weaving.

994. Fielding Fletcher. Certain improvements in water-closets.

996. Rodolphe Thiers. A machine for manufacturing stretchers of umbrellas and parasols.

998. Joseph Lacassagne and Rodolphe Thiers. An electro-metric regulator for electric telegraphing, lighting, and electro-motive purposes.

1008. Henri Gustave Adrien Pecoul. A new mode of generating power in steam-engines.

1011. Henri Marquis de Balestrino. Improvements in obtaining motive power by the aid of explosive gases. A communication.

1035. Thomas Williams and John Hobson Fuller. Improvements in wrenches, pliers, and spanners.

1056. Frederick William Norton. Improvements in the manufacture or production of figured pile fabrics.

1058. Charles Jared Hunt. Improvements in tug and other hooks.

1059. Joseph Hallam and John Elce. Improvements in the construction of rowels or toothed cylinders for self-acting temples and other purposes.

1061. Nehemiah Brough. Improvements in slide-buckles.

1070. George Robinson. An improved invalid's bed.

1089. John Mason, Samuel Thornton, and Leonard Kaberry. Improvements in machinery or apparatus for preparing cotton and other fibrous substances, for spinning yarns or threads, and for finishing or polishing such yarns or threads.

1105. Charles William Siemens. Improvements in cooling and in freezing water and other bodies.

1117. Frederick Delacourt Blyth. Improvements in the manufacture of tea-trays, picture-frames, and other similar articles from papier maché.

1134. Thomas Piggott. An improvement or improvements in telescopic gas-holders.

1183. John Allen and William Allen. An improvement in applying heat to alkaline solutions, and to drying and making alkaline salts.

1250. Richard Archibald Brooman. Improvements in dyeing cotton, threads, yarns, and twists. A communication from Charles Joseph Eugene Abder Halden, of Mulhouse, France.

1331. William Barrington and William Richard Le Fanu. An improved mode of joining "bridge-rails" in the permanent way of railways by means of a fish-piece.

1389. Edward Myers. Improvements in machinery or apparatus for raising water or other liquids.

1392. John Jones. Improvements in obtaining motive power.

1537. François Loret-Vermeersch. The improvement of looms for weaving.

1653. Edward Myers. Improvements in buffers and other springs for railway and other carriages.

1757. Auguste Edouard Loradoux Bellford. Certain improvements in grinding-mills. A communication.

1784. Caleb Bedells. An improvement in the manufacture of elastic fabrics.

1787. John Henry Johnson. Improvements in the manufacture of India-rubber. A communication from Austin S. Day, of the United States.

1794. Nathaniel Smith. An improved horse-rake.

1796. Robert Barlow Cooley. Improvements in the manufacture of hats.

1799. John Sidebottom. Improvements in shuttles and in skewers for shuttles and other purposes.

1804. Peter Armand Lecomte de Fontainemoreau. Improvements in feeding steam-boilers. A communication.

1827. Walter Brown. Improvements in the manufacture of sheet metal casks and kegs.

1833. Walter Hancock. Improvements in the manufacture of casks, or barrels, or of the linings of the same, and which improvements are also applicable to other hollow vessels.

1842. George Shears. An improved construction of stereoscope.

1874. William Sangster. An improvement in the manufacture of umbrellas and parasols.

1880. André Dubrulle. Improvements in safety-lamps.

1882. Francis Journeaux. Improvements in drying wheat and other grain.

1894. Lucius Paige. Certain new and useful improvements in brake mechanism for railway-carriages.

1910. William Denton. Improvements in drawing wool and other fibrous substances off the combs of combing machines.

1969. John Hope and Thomas Hope. An improved machine for engraving the surface of a calico printer's roller, preparatory to its being etched.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

NOTICE OF APPLICATION FOR LEAVE TO ENTER DISCLAIMER.

A petition has been presented to the Attorney-General for leave to enter a disclaimer to parts of the Specification of the patent granted to John Taylor, of the Adelphi, Middlesex, gentleman, for "Improvements in separating metals from each other, and from certain combinations with other substances." Dated 15th April, 1845.

LIST OF SEALED PATENTS.

Sealed September 7, 1855.

505. William Weild.
507. John William Sloughgrove and James Henry Wheatley.
521. John Aitken, Servetus Aitken, and John Haslam.
525. Julian Bernard.
541. Alexander Clark.
544. Charles Heaven.

Sealed September 10, 1855.

556. David Macaire.
568. Robert Neale.
571. Jonas Marland.
575. Joseph Turner.
625. Benjamin O'Neale Stratford, Earl of Aldborough.
629. Isaac Rogers.
653. T. F. E. Clewe.
661. John Britten.
691. William Henry Gauntlett.
693. Frederick William Mowbray.
869. Charles McIlvaine Congreve.
937. Julius Jeffreys.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

W. R.—You misapprehend the cause of the rocket's motion, which is due to the fact that the gases generated within it produce an unbalanced pressure, and not to the resisting action of the atmosphere, as you assume. This error vitiates your letter so greatly as to leave it without a claim for insertion in our pages.

Thales.—Your letter on "The Projectile Controversy," while it certainly contains some remarks of a pertinent and sensible character, is, nevertheless, so violent and offensive that it can by no means be inserted. We do not wish to exclude either wit or sarcasm altogether from the discussions maintained by our correspondents in our pages, but vulgarity and ferocity we cannot knowingly give place to. Although the correspondent whom you attack is anonymous to our readers he is known to ourselves, and known, moreover, to be a gentleman of too much cultivation and taste to meet any opponent who furnishes himself with such weapons as those you seek to assail him with. We make these remarks thus freely as you are anonymous to both our readers and ourselves.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of* London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin; W. C.* Campbell and Co., Hamburg.

[redacted]

Mechanics' Magazine.

No. 1676.] SATURDAY, SEPTEMBER 22, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

RENNIE'S PATENT MARINE ENGINES:—THE DISC ENGINE.

Fig. 2.

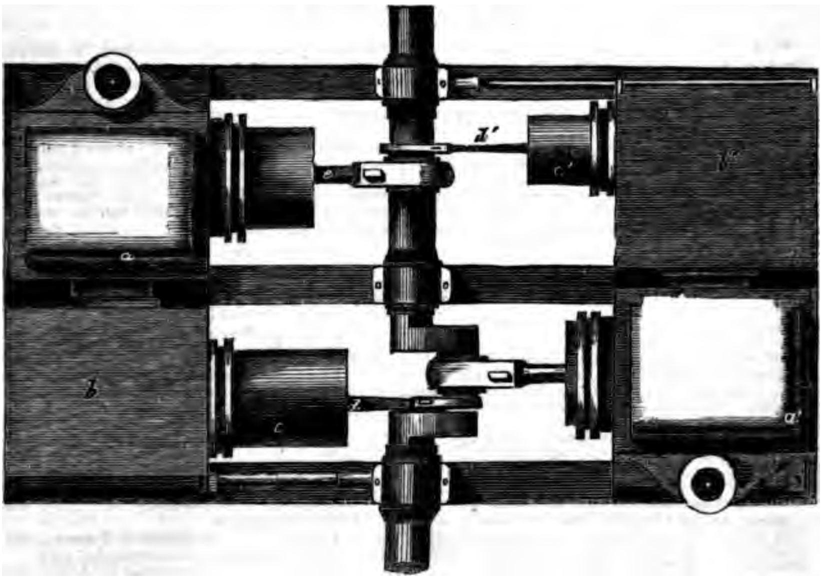
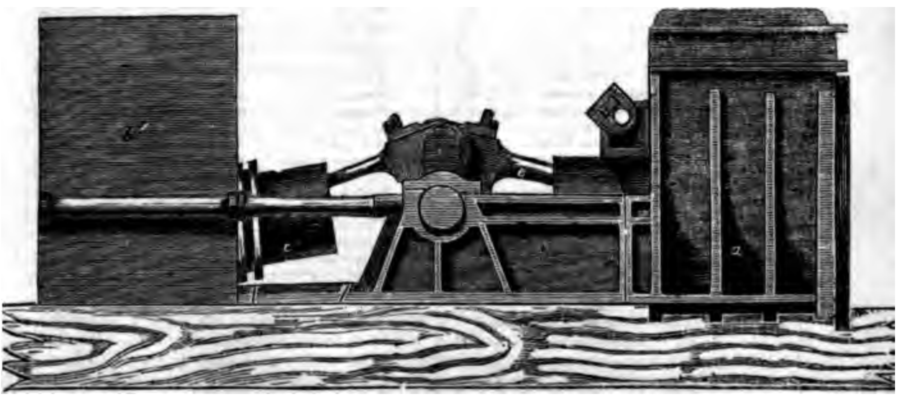


Fig. 1.



RENNIE'S PATENT MARINE ENGINES:—THE DISC ENGINE.

Messrs. G. Rennie and Son have recently patented an improved arrangement and combination of the several parts of horizontal marine steam engines, which will be seen to possess several advantages. The arrangement of the cylinders, condensers, and air-pumps, and the mode of driving them, are shown in the engravings on the preceding page; fig. 1 being a side view, and fig. 2 a plan, of a pair of engines constructed with the improvements. The patentees place the cylinder, *a*, and its condenser, *b*, of one engine, opposite the cylinder, *a′*, and its condenser, *b′*, of the other engine, in such manner that the cylinder, *a*, of one engine shall be opposite the condenser, *b′*, and air-pump, *c′*, of the other engine, and that the cylinders *a*, *a′* and condensers *b*, *b′* of each engine shall be on opposite sides of the main crank shaft. The air-pumps, *c c′*, which are hollow plungers or trunks, placed at convenient angles in the condensers, are worked or driven by means of connecting rods, *d*, *d′*, attached to the main cranks, and at the bottom or thereabouts of the hollow plungers or trunks. The crank, which is worked by the cylinder, *a*, and connecting rod, *e*, of one engine, works the connecting rod, *d′*, and air-pump, *c′*, in the condenser, *b′*, of the opposite engine, as shown in the engravings, so that in case of one engine being deranged, the other may be worked separately.

We avail ourselves of the opportunity offered by the publication of the above improvements of Messrs. Rennie and Co., to carry out an intention, formed some time since—that of directing the attention of our readers to the energetic manner in which the disc engine, (as improved by Mr. Bishopp,) has recently been brought into use by that firm.

It is well known to most of our readers, that the admirable principle on which the disc engine is constructed was, for a number of years, associated with so many manufacturing difficulties, that the arrangement, during that period, was but very rarely adopted. These difficulties were, however, from time to time diminished by the improvements of successive patentees, and in 1849 disc engines, constructed with the modifications of Mr. G. D. Bishopp, were employed with great success, in the printing-office of the *Times* newspaper, and on board H. M. steam vessel, the *Minx*, as has already been recorded in our pages (see *Mechanics' Magazine*, vol. li. pp. 5, 40, 241, 570). The following details of the subsequent progress of the engine we derive from the number of *Cosmos* for August 31, which contains a long and elaborate article upon the subject, occasioned by an inspection of a model of one of the improved engines, which is exhibited by Messrs. Rennie, at the Paris Universal Exhibition.

Towards the end of 1849 Messrs. Rennie engaged Mr. Bishopp as foreman of their works, with the view that he might particularly devote himself to the construction and extension of the disc engine; and five years of experience convinced them that it was admirably suited to drive the propellers of ships, and generally to communicate rapid rotary motion by direct action.

Astonished by the unhoped for success which was obtained with a small steamer 33 feet long and 4 feet broad, Messrs. Galloway, the agents of His Highness Saïd Pacha, Governor of Egypt, ordered of Messrs. Rennie a small iron steamer, intended to ply on the Nile, the Mammoudeh Canal, and the Lake of Menzaleh, and which was required to fulfil the following conditions, viz.: that the draught of water should not exceed 2 feet, and that she should screw at the minimum rate of nine knots an hour. Her form and dimensions were left to the judgment of the constructors, who adopted the following proportions: Length, 60 feet; breadth, 6 feet; draught of water, 21 inches. Her fore and after lines were very fine. She was fitted with a boiler 6 feet 8 inches long, and 5 feet in diameter; two small disc engines, 13 inches in diameter; and two screw propellers, one on each quarter, each 2 feet in diameter.

In a trial on the Thames, with steam at 45 lbs. pressure, the propellers made from 310 to 320 revolutions per minute, and the vessel 10 knots per hour. This was exceeded on the Nile, when a trial was made by order of the Pacha, the pressure being increased to 60 lbs., and the speed to 12 knots, the vessel thus beating all the paddle-boats on the Nile, and frequently making the voyage from Alexandria to Cairo, a distance of 172 miles, in 10 hours. On one occasion she towed a loaded barge of 80 tons at from 4 to 5 knots per hour. By reversing the steam in one of the engines, the vessel could be made to turn in her own length, and she might be stopped almost instantaneously. No other steam engine could have given more astonishing results.

In 1853 the Russian Government purchased of Messrs. Rennie a disc engine of 13 inches in diameter; it was placed in a gun-boat 55 feet long and 8 feet 10 inches broad, which an engine on Captain Fitzmaurice's principle had been unable to move. The disc engine, *however, with* the same boiler, propelled at the rate of 7 knots an hour, to the great satisfaction

[redacted]

of the Grand Duke Constantine and the Russian Admiralty. Many of these engines were consequently to have been supplied to the Russian Government had not the outbreak of the war prevented.

The writer in *Cosmos* very properly expresses the admirable fitness of engines constructed upon this principle, for the French and English gunboats, which are required for service in the shallow waters of the Gulf of Finland, and the Sea of Azoff. We hope that the English Admiralty will see that the suggestion is carried out during the coming winter, preparatory to the coming campaign in those waters. It cannot be denied that the furnishing of light draught gunboats, with suitable engines, has presented many difficulties to our engineers, and the Admiralty cannot now afford to slight well-tested improvements, which are applicable to purposes of such great importance.

After detailing the results of a number of experiments which fully demonstrate the admirable adaptation of the disc engine to navigation and towage in canals, the article proceeds to point out the general advantages of this machine. 1. It is much lighter, less bulky, more compact, and more easy to transport than ordinary motive power engines; and since the number of its parts is smaller, and its construction more simple than theirs, it can be furnished at a lower price. To give an idea of the difference of weight, we may say that a 300 horse engine (neglecting boilers, coals, and propellers, which are the same for all cases) would weigh 60 tons if fitted with reciprocating pistons and gearing, 40 tons if fitted with similar pistons and direct-action, and 30 tons only if a disc engine. 2. It has all the advantages of rotary engines without any of their inconvenience. 3. In the judgment of very eminent engineers who have attended the comparative experiments to which it has been submitted, with the same boiler, the same fuel, and the same labour, it has realized a mean economy of fuel of 18 per cent. 4. At a velocity equal to that of a piston, that is to say, when the edge of the disc runs the same space in a second as the piston-rod of an ordinary engine, the shaft of the disc engine makes a number of revolutions equal to three times that made by the shaft of the reciprocating engine. Messrs. Rennie have often seen a disc engine of 13 inches in diameter attain a velocity of 320 revolutions per minute, without any wheel-gearing. This velocity, combined with its small bulk and weight, and the facility with which it may be worked at high pressure with as much ease, regularity, and smoothness as a low-pressure condensing engine, and with no dead points, render it eminently adapted, as experience has proved, to the purposes of steam navigation.

Messrs. Rennie, says *Cosmos* in concluding, who are among the most eminent constructors of England, and who are eminently skilful, practical, and trustworthy engineers, affirm that the disc engines, improved by Mr. Bishopp, and constructed at their works, are not only comparable to the best machines known, but possess all the advantages which we have enumerated. Their deep conviction has led them to constitute themselves the leaders, as it were, of the progress which these machines have realized. We know that they have hitherto met with strong opposition,—that there are competent men who declare them inferior to Penn's machines, which are their *beau idéal*, and allege that the construction of the disc engine is attended with great difficulty, and its operation with considerable escapes of steam which it is nearly impossible to prevent. It is for the international jury (of the Paris Exhibition) to test these allegations; and we await their decision with impatience, because of the magnitude of the interests affected by the question.

It should be remarked that the principle of the disc engine has been applied very satisfactorily to pumps, and has been found to give a useful effect of 97½ per cent. of the theoretic work, a result which ranks it with the very best hydraulic motors known.

COCHRAN'S ROTATING SHOT AND SHELL.

(Patent dated March 5, 1855.)

Mr. Cochran, of New York, has recently patented in this country (as a communication to Mr. R. A. Brooman) a method of constructing solid shot and shell in such manner that they may be fired from the common smooth-bored firearms or cannon, without windage, and with a rifle or rotary motion about their axes, such as is imparted to elongated or conical projectiles when fired from rifled or spirally-grooved arms.

Fig. 1 of the accompanying engravings is a longitudinal section of a shell constructed according to the invention; and fig. 2 is an end view of the same; fig. 3 is a longitudinal view of a conical ball partly in section, and fig. 4 is an end view of the same. C C, is the body of the shell and of the balls; E E, are spiral holes commencing at or near the point, and terminating near the base. The number of these holes may be varied, and their form may also be varied, without departing from the principle of their construction. In the shell shown in figs. 1 and 2, there are four of these holes running nearly parallel to the exterior of

the shell, but in a spiral direction, this arrangement being adopted so as not to interfere with the hollow of the shell and the means of firing it. In the solid shot represented in figs. 3 and 4, there are two spiral holes shown, which terminate in one at the point or forward end.

The principle on which these projectiles are constructed consists in applying the resistance which the air opposes to their projection in such a way as to produce their rotation or rifle motion. This is effected by means of the spiral holes, E E. When the projectiles are fired the air rushes through

Fig. 1.

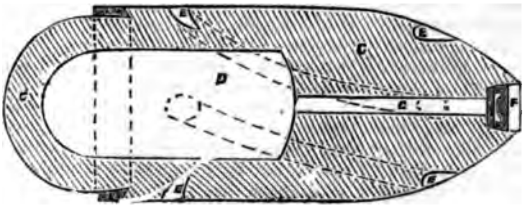


Fig. 2.

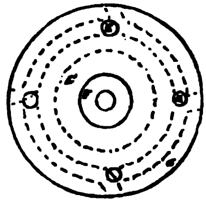


Fig. 3.

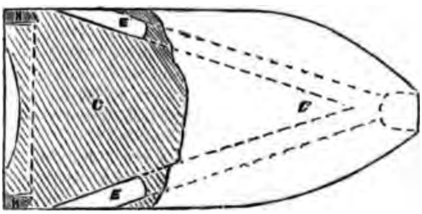
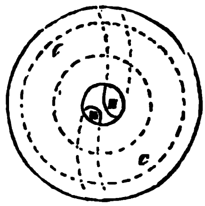


Fig. 4.



the spiral holes, and in so doing produces the rotary motion of the projectiles about their axes in the same manner as water rushing out of a turbine wheel effects the rotation of the latter. The rotation or rifle motion may also be produced by making the spiral holes, E E, to spring from the base or bottom part of the projectiles, so as to allow the force of the discharge to effect the rotation.

The shell shown in figs. 1 and 2 is of the percussion class; that is, it is caused to explode by the act of striking the object against which it is directed. D is the cavity which receives the charge of powder. F is a round hole or recess at the front part of the shell, and G is a passage through which the fire is communicated to the charge. This passage is stopped by a disc, having a central aperture, over which is placed a piece of some detonating mixture, which is completely covered by a second disc, having at the centre a projection, which is prevented from coming in contact with the detonating compound, until the shell strikes an object, by means of an annular flange formed for that purpose around the second disc.

The prevention of windage, which is essential to secure the greatest possible range, and to ensure a true direction, is effected in the following manner: A dovetailed or undercut groove is formed around the shell or ball at its rear end, as shown in figs. 1 and 3, and a ring or band, H, composed of some malleable metal, is fitted thereto. The force of the discharge drives the ring or band forward into the dovetailed groove, and at the same time expands it so as to cause it to completely fill the bore of the cannon, thereby effectually preventing windage. It will be found advantageous to wind the body of the shell or ball at A with spun-yarn dipped in grease, in order to lubricate the bore of the piece.

ON THE FORM OF PROPELLING BLADES.

BY THOMAS EWBANK, OF WASHINGTON, D.C.*

It is demonstrable that the highest attainable speed is impossible with paddle-planks, utterly impossible, and that it can only be attained in connection with other engineering desiderata; such as the least waste of power, the least amount of material in the blades, the diffusion of the resistance over their entire surfaces, every section producing equal effects though very unequal

* Abridged from the *Journal of the Franklin Institute*.

in area, the centre of resistance not at the extremity but in the centre of the blade, and thereby putting the least strain upon the arms or levers. When these properties and the utmost *thinness* in blades, their smooth working, freedom from liability to sudden or increased strains are acquired, the true form will have been obtained, and, what may appear problematical to many, they will be found to have proceeded from it—illustrating a cardinal truth in physics, that in proportion as a device approaches the truth in form, it approaches it in every other particular.

It is, however, a melancholy fact that there is among our engineers a prevailing indifference to and unbelief in the value of form, which can only be ascribed to their not having looked into the subject They do not perceive how two blades of equal areas, but differing in their outlines, should possess different properties; surface, not boundaries, being what they rely on.

That there is an innate relationship between cause and effect, and that the latter is modified by the instruments through which the former acts, is obvious to every body. A blunt, that is, a badly formed tool, consumes more power than a sharp one, and gives inferior results; so it is with everything through which force is conveyed. Mechanical science rests upon principles that determine forms and proportions. *There is of necessity a best form for every thing and for every purpose.*

What, then, is the form of propelling-blades which communicates properties not found in common ones? In general terms, it is that which is exemplified in Nature's blades. The law that determines them makes them *long*, *narrow*, *tapered*, and *pointed*, and contracts and expands these features as speed is to be diminished or increased. The form and application are antipodal to rectangular buckets, because the blade must taper as it dips; the deeper it enters the water the narrower it must become.

The effects of this simple change of form are as surprising as they are important. The most essential attributes of a propeller are evolved.

1. *The least amount of material in the blades.* They are not made uniform in thickness, but are thinned away towards their extremities, a feature incompatible with rectangular blades.

As the reduction of thickness of natural blades outwards is a permanent feature under all circumstances, it might have been inferred from that fact that the same trait might be indispensable to success in artificial propulsion. It has not been so inferred, and we are therefore led at once to inquire why natural blades are reduced outwards and to a mere film? Because length of stroke virtually *diminishes with thickness*, and *a waste of power keeps pace with it.* This is demonstrated in our paddle-wheels. If a pair of these were made in the form of close drums or solid cylinders, they could, of course, have no propelling power whatever; no more than have grindstones revolving in their troughs. Suppose half of each removed, and the usual number of arms and buckets or blades put in their places, the wheels, as they might then be called, could have only half the usual power; and if one-third, one-fifth, or any other proportion of the cylinder were left, in the same proportion would their capacity for propulsion be neutralized. It is, therefore, an inexpugnable truth, that whatever may be the number of blades in a wheel, the sum of their thickness must be deducted in every revolution from their sweep through the water, in order to determine their propelling capacity, or the work they should perform. In the supposed case of half the wheels being solid, the semi-cylindrical masses were simply distorted blades.

Taking the mean thickness and number of the massive planks that constitute the blades of ocean steamers, they lose from this cause from eight to ten feet of stroke in every turn of each wheel. Assuming two hundred and fifty thousand revolutions as the average number in a trip across the Atlantic, over five hundred miles of stroke are thus lost in each wheel; or, in other words, between twenty and thirty thousand pounds of timber are whirled that distance through air and water, and to no purpose but consuming power, and wearing out the motive machinery. We may commit all manner of delinquencies in construction, but we cannot harmonize a philosophical truth with an opposite error. *Thinness* of blades and the *least material* in them, and the consequent least expenditure of power, depend upon form. There is no separating them. Instead of being tapered away toward their extremities as in natural instruments, ordinary blades are made as blunt there as anywhere else. They are, in fact, often made thicker by bolting on additional slats, and they require this, since the resistance is accumulated there.

2. In the *reduction of the number of blades.* The adoption of tapered ones would enable us to throw overboard two-thirds or three-fourths of the number now used, with the same proportion of shafting, as not simply useless, but positively injurious. This cannot be done with the present blades, on account of the jarring caused by their violently slapping the water as they come down upon it. When few blades are used, the effects of

this are seriously destructive; and hence to reduce the concussion the number is increased, on the principle of dividing a few large blows into many little ones. Some boats have had seventy-two blades on each wheel; many have now thirty-six. Thus one error called in another, for it was not perceived that as their number was multiplied, their efficacy was diminished.

A correct form would have removed the evil at once and the cause of it. Instead of a propelling surface, extending from twelve to fifteen feet from a vessel's side, being brought in sudden conflict with a wave, a mere point of the blade would have been presented to it. Instead of attempting to arrest the swell, and be shaken or carried away by it, it would go softly and silently into and through it.

3. In *removing the centre of pressure* from near the extremity *to the centre of the blade*, and in an *equable distribution of pressure over its face*. It is the characteristic of a good and durable instrument that its material is so distributed that every part contributes its due proportion of influence towards the intended result, *and no more*. No other criterion than this is required to determine degrees of worth or worthlessness. How is it with rectangular blades? Why, in truth, it must be admitted that in this respect they are defective, and to a degree which I suspect can hardly be paralleled in modern mechanism. Their lower parts, sweeping through greater spaces in the same time than those above them, do most of the work, nearly all of it, and thus destroy the equilibrium of pressure on the face of a blade, which, *above all things* else, should be secured, and introduce an element of destruction that reaches from them to every thing connected with them. One-third of a steamer's blades have been removed from their upper parts without diminishing in the least her speed; a result that might safely be predicted of some boats now running.

An equable distribution or equilibrium of pressure on a surface whose several sections are immersed at unequal depths and moved with unequal velocities might seem impossible on a first thought; but a second one would suggest that there must be, *per se*, some provision of the kind for this class of movements, as there are for others, and that, too, by varying the outlines of the surface without enlarging it—a principle equivalent to that exemplified in the lever by simply moving the fulcrum; and in fluids to that by which a pint of water may be made to balance a gallon or a thousand gallons: THE principle, in fact, which raises or lowers the centre of pressure on a blade; *not by adding anything* to it, but by merely widening or narrowing it—*which modifies velocity by surface and surface by velocity*, so that every portion meets only its proper amount of resistance, and all portions harmonize in bringing out one result.

4. Another beautiful result is, that though the blades may taper to a point, a section near that point does just as much work as an equal section through the widest part; extended sweep compensating for diminished surface.

Such are some of the results of form in propelling blades, and they are what are now wanted to enable us to begin a new career in ocean steamers.

Variously shaped blades have been tried on the stern submerged propeller, but for them no definite form has been developed. Most of them are as wide of the truth as the planks of side-wheels. The resistance is accumulated at their extremities; the largest extent of surface is there, and consequently the greatest strain upon the levers or arms and shafts. The true form, whether worked at the side or stern of a vessel, is only to be determined by the properties named; and, as already remarked, they are applicable to every propeller. The law makes no discrimination in favour of one application over another.

The blades of *oars* partake of the same defect as those of steamers' wheels, though in a less degree, because of their being applied in the direction of their length, instead of being attached across the ends of their levers. Uniform in width, the parts farthest from the centre of motion move with greater velocity than the rest, and hence it is the end of an oar that does most of the work: portions in the rear move slower than it—they are *behind* it in their action and cannot therefore sympathise or coalesce with it. In some oars, the ends of the blades are wider than the other parts, when the defect is still greater.

To enable an oar blade to return an equivalent for the power transmitted, it should diminish in width from near the middle of its length, and in such a ratio that every part may perform an equal proportion of work, and in *unison* with every other part.

The object of the foregoing remarks is to awaken attention to a problem in practical science, than which there are few of greater and none of more immediate value.

It is greatly to be desired that the Government would institute, through a commission, a series of experiments to determine the true forms and proportions of propelling blades. The report would be of permanent and world-wide interest.

[redacted]

A Treatise on the Stability of Retaining Walls, elucidated by Engravings and Diagrams. By JOHN MURRAY, Civil Engineer, M. Inst. C.E. First Part. London. Published by John Weale, 59, Holborn. 1855.

WHAT the author proposes to himself in laying this book before the public is thus stated in his preface:—"Having on many occasions been required to make drawings of Retaining Walls for works brought under my notice as an Engineer, in Canals, Railways, Rivers, and Docks, I have, like others, only had experience to guide me. On referring to the meagre publications in the English language, I found their contents, for the most part, based on theory, with little or nothing practical on the subject. The French authors, who were more numerous, have entered minutely into the former, but have overlooked much appertaining to the latter. The theorems at last are so complicated, that few engineers attempt to unravel them, and consequently no reliance is placed on the results. I have thus been induced to put some observations and notes in the form of a Treatise on the Stability of Retaining Walls."

The object here proposed is well worthy of the efforts of a gentleman combining the resources of a competent mathematician with the varied experience and practical acquirements of a civil engineer.

In such a treatise we should desire to find the whole subject treated fully, as regards both the theory and practice. The author might either introduce a short elucidation of the elements of mechanical philosophy, as far as they affect the branch of applied science in question, or, thinking that this would trench too much upon his space, might remand the reader to some standard work for this information. Whatever mechanical information, however, he thought it advisable to introduce, we should expect to be clearly and philosophically expressed. The theory itself we should hope to find simply yet fully exposed, care being taken to remove all possibility of difficulty and confusion in its application. An expert mathematician would also be expected to discover some means of bringing the correct results of sound theoretical writers into a more simple form, and into accordance with the requirements of the practical man. If it were thought necessary to trace the history of the subject by giving some account of the imperfect theories of early writers, this part of the subject we should expect to find incorporated in the preface, or at least treated by itself in a professedly historical manner. Finally, when the author came to the most important part of his work, which is, in our opinion, the critical analysis of carefully-selected examples, we should expect to find the most approved theory applied to the investigation.

This is a brief outline of what we should look for in a standard treatise on retaining walls. Such, we regret to be obliged to say, is not the character of the book before us.

Imagine an engineer sitting down to consult all the works written on this subject from the earliest period, copying indiscriminately all the theories which he should find on the subject, and in the end leaving the reason in a delightful state of doubt and perplexity as to which of them ought to have the preference, and then in his examples applying a false mode of computation to a modification of the correct theory; all this preceded by a few meagre statements of mechanical facts, with little attempt at method and arrangement, and some idea may be gained of Mr. John Murray's Treatise on Retaining Walls.

To illustrate our statements, we propose to lay a few of the details of the book before the reader.

The first chapter on the centre of gravity of walls, furnishes us with the following very lucid proposition. "If a power be applied to a pivot or fulcrum of a given body, and so support it without disturbing the remaining parts, *the point acted upon is in the direction* of the centre of gravity."

With the remainder of this chapter, which consists of formulæ for finding the centre of gravity of different walls, we have no fault to find, except that in the fifth and sixth cases on page 5, the greater quantity with a negative sign, is placed after the less with a positive sign, in a manner calculated to perplex the merely practical man, and which ought by no means to have been overlooked, especially as the same error occurs in the numerical illustrations.

In the second, we find a very meagre exposition of the principle of the lever; and a formula for finding the base of a triangular wall, calculated to support a given horizontal thrust, which we consider faulty in an essential particular, inasmuch as it assumes the weight of a cubic foot of the material of which the wall is composed, to be unity. The result given is, $a=\sqrt{3P}$. It is true the author in his applications of this and analogous formulæ, introduces the necessary limitation, by dividing P (the power or thrust) by the weight of a cubic foot of the material. But as he never gives any reason for this, the inexperienced reader must be sadly perplexed. All difficulty would have been removed had he at once assumed $w =$ weight of a cubic foot of the material of which the wall is composed, and made his formula

$$a=\sqrt{\frac{3P}{w}}$$

and also made the corresponding formula for the wall with an exterior slope

$$b=\sqrt{\frac{2P}{w}+\frac{d^2}{3}}-d$$

The third chapter is devoted to the question of the pressure against vertical walls, apparently, though not professedly, of a fluid. It also contains two more than questionable propositions, by Ware and D'Antony, having reference (as we are also left to infer for ourselves) to the form of greatest strength with the least quantity of material.

The fourth chapter contains a statement of Coulomb's principle of the wedge of maximum horizontal stress, with three tables, one of the natural slope of different soils, the second of weights of different kinds of earth, &c., and the third of the weights of different kinds of building materials.

But the fifth chapter is the crowning effort of the whole work. It contains no less than thirteen theories, all more or less different (at least in the mode of expression) on the pressure of earth against vertical walls. The first of these is manifestly unsound, as it supposes the weight of the pressing wedge of earth to act *horizontally*; the second varies the case, by supposing the weight to act parallel to the natural slope. We are not informed where the author found these precious theories, but they are interesting, from the circumstance that in the calculations he makes in the seventh chapter, he combines the unsound hypothesis of the direction of the weight of earth being parallel to the natural slope with Coulomb's correct principle of the wedge of maximum thrust.

No guidance is given to the reader as to which of these theories he should prefer: they are all apparently (except the first two and Belidor's, which are condemned) equally sound in the author's estimation, except that when he does manage to get hold of the theory which is now universally received by mechanical philosophers, he tells us the expression is too complicated for use, and he therefore rejects it. Woltman's Theory, which is identically the same as Gaultiere's Exposition of Prony's (of which circumstance our author seems happily unconscious), is treated as a separate theory, and calculated accordingly.

Now from this account of the chapter, what useful information can we possibly expect the practical man to derive from it? With what feelings but those of disgust will he ever look upon science, if he should unfortunately (as is too likely to be the case) inseparably connect the idea of science with the mass of confusion offered to his digestion in this book.

Again, the reader has a right to complain of the very capricious manner in which the author treats him with respect to mathematical knowledge. He sometimes, as we have already observed, offers him the most meagre fare, as in the second chapter; while at other times he serves up to him theorems spiced with the Differential and Integral Calculi. These, by the bye, we will do Mr. Murray the justice to observe, are translations from French authors. And in one of them a very whimsical mistake occurs, which we at first thought a typographical error, but which on further consideration looks very like the error of a translator, who is somewhat puzzled with the language of the Calculus.

On page 32, line 20, we read:

"Integrating this expression. Since $z=o$ even to $z=h$ we find for the sum of the moments

$$\tfrac{1}{6}\, y\, h^{3} t^{2}."$$

A tolerable mathematician might give a shrewd guess as to the meaning of these extraordinary words. We strongly suspect that the original runs thus:

"*Integrant cette expression depuis* $z=o$ *jusqu'à* $z=h$ *nous trouvons*," &c.

The correct translation of which is:

Integrating this expression from $z=o$ to $z=h$ we find, &c.

The nature and origin of the error will (if our surmise be correct) be apparent to those of our mathematical readers who understand French. We cannot, however, esteem very highly the qualifications for the task he has undertaken of a translator who could commit it.

We have already stated that the calculations in Chapter VII., "On the different forms of walls capable of resisting the pressure of the earth," are vitiated by the incorporation of a false principle, as regards the direction in which gravity acts. It may be that the forms therein discussed are stable: but it certainly is not in consequence of the soundness of the theory employed on the occasion. Had the work under discussion at all answered to our notion of what such a work ought to be, we should have been glad to recommend it. As it is, we feel that were we to do so, we should be guilty of sacrificing the interests of science without offering any corresponding advantage to the practical engineer.

The subject is an interesting one, and we should be glad to see it successfully treated. We may perhaps recur to it on a future occasion.

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ALLAN'S ELECTRIC TELEGRAPHS.

We were glad to observe in the *Daily News* of Monday last the following independent testimony borne by a correspondent to the merits of the improvements in electric telegraphs which have from time to time been patented by Mr. T. Allan, and which have been described and spoken of favourably in our pages.

Mr. W. B. Turnbull, of Lincoln's-inn, is the writer, and his remarks are as follows:

In your paper of yesterday you observe most truly that "it is well known in the scientific world that great modifications of the telegraph are on the point of being made;" that "it is susceptible of improvements which will multiply and increase its modes of usefulness;" and you mention the name of Professor Wheatstone as being only prevented by the monopoly of existing companies "from introducing improvements which would go far to revolutionize the system of electric communication."

I have no desire to detract from the merits of Professor Wheatstone—far from it. But I think that it is only an act of justice to state, that all the scientific improvements which you predicate, and many more, have already been made and patented by Mr. Thomas Allan, of the Adelphi, whose sole attention has for years been directed to the telegraph and electro-magnetism in all its phases. And, further, that it is not merely the monopolies which are to be blamed for the non-adoption of his—I may truly call them—"marvellous realities;" but the shortsightedness, even in what regards their own interests, of the capitalists of this metropolis, and—which is altogether indefensible—the culpable indifference of those members of the government whose duty it should be to watch, and instantly adopt, every improvement in such department of science as directly bears upon the service of the public. And that some of them cannot plead ignorance of these powers of Mr. Allan is well known; although they seem to prefer to persist in continuing the old system of things, with all its defects and inconveniences, rather than put themselves to the trouble of making a change which would economise both the time and the money of the nation.

THE PROJECTILE CONTROVERSY.

To the Editor of the Mechanics' Magazine.

Sir,—No one can deny that the new school of practical philosophers possess, in an eminent degree, the virtues of boldness and tenacity.

"Civil Engineer" is now reduced to solace himself with the reflection that he is "happy to observe that the old untenable doctrine of equal spaces in equal times is no longer esteemed as worthy of notice in a practical and serviceable point of view." To this consoling reflection I shall leave him, with the single remark, that this old untenable doctrine, as I proved in my last letter, never had any existence except in his brain, and that no change has taken place in the tenets of mathematicians on this subject, either in consequence of, or contemporaneous with, this controversy, as "Civil Engineer" seems to imply. With regard to Mr. Hopkins's parallelogram, all I have to say is, that it remains to be proved that the velocity impressed on a body by a *projectile* force, when that force has ceased to act, is of an "evanescent character;" in other words, that the first law of motion is not true. It were much to be desired that the practical school would condescend, from the elevated regions of universal negation in which they seem to take delight, to the more common-place arena of proof. We have been frequently threatened with proofs that the first law of motion is incorrect; but its opponents have never got beyond the threat. Meanwhile the case stands thus: we have an elaborate system, founded on the first law of motion, which admirably and accurately accords with the observed facts of cases of motion almost innumerable. The practical school boldly deny its truth, but have not as yet advanced anything to supply its place, and have carefully abstained from committing themselves to any demonstrations, or, in fact, to anything beyond the boldest generalities. If they are content to allow the contending parties still to occupy this relative position, I, for one, shall not complain; but in that case your readers will have no difficulty in forming a judgment on the relative claims of the opponents to truth and candour.

Mr. Mushet's letter, in your last number, places me in this perplexity;—while it embraces a vast variety of subjects, and deals boldly and largely in negation, we have nothing but his own authority for the *dicta* which he wishes us to accept in lieu of the received doctrines. Mr. Mushet's name may be a tower of strength in the estimation of those who have the advantage of knowing him; but we who have not that advantage should be more likely to appreciate the force of a little proof and argument. I really find it very difficult, on this account, to meet him; because he gives us no *locus standi*. To endeavour to correct him, until he condescends to proof, is to waste one's strength on an adversary who is continually vanishing into thin air. Such parts of his

letter, however, as are not of this "evanescent character" I will now endeavour to subject to the ordeal of an impartial criticism. We are told by him of the "astounding fact" that all our astronomical notions are erroneous, because no astronomer but Mr. Hopkins has applied the principle of refraction to "the apparent diameter of the sun at different altitudes in different seasons of the year." And he then gravely tells us, that the correct observations of Mr. Hopkins have annihilated this *apparent* variation of diameter, as also that of the sun's longitude.

Mr. Mushet will probably be astonished to hear, that not a single observation is made with the splendid mural circle on Greenwich or at any other observatory, without a correction for refraction being carefully applied to it. He will be astonished also, doubtless, to hear that astronomers have bestowed the greatest pains on ascertaining the true law of refraction, and have succeeded in obtaining it to a great degree of exactness. Moreover, as the sun's apparent diameter is the *difference* of the observed altitudes of his upper and lower limb, any small error that might exist in the *amount* of refraction in the two observations taken separately would almost, if not quite, disappear in this *difference*, which amounts at most to 32′ 35″.

We are, of course, unacquainted with the nature of Mr. Hopkins's "correct observations;" but it would be interesting to know what they are, how they were made, with what instruments, and what correction was applied for refraction, in order that we might be in a position to compare them with the very careful observations made by the most experienced men, and with the most "splendid" instruments at Greenwich and elsewhere. Really it is too bad to be objecting to us at every turn, Mr. Hopkins says this—Mr. Hopkins denies that—while that gentleman is so modest as to keep us in the dark as to the valuable scientific labours he has undertaken, and has communicated them, it seems, only to Mr. Mushet and a chosen few.

For the present we must be content to believe in the Astronomer Royal and his assistants until the *true theory* is propounded.

Mr. Mushet having settled to his satisfaction that there is no real variation in the sun's diameter or longitude at different seasons of the year, professes his inability at the moment "*to remember* how the astronomers have dealt with consequences of this variation in the orbitual velocity, such as the necessity for increased rapidity in the earth's rotation, as well as revolution, in the perigee section of the orbit, to preserve the equal number of days between the equinoxes."

It would be very strange if this had been in Mr. Mushet's remembrance, for this simple reason, that astronomers have never dealt with, or been called upon to deal with, these (imaginary) consequences. This furnishes another instance of the proneness of our practical school of philosophers to invent "*suppositions*" for the gentlemen they delight to attack.

The fact is, that there is *not* an equal number of days between the equinoxes; but the sun is at present about 7 days 16 hours and 50 minutes longer in passing from the vernal to the autumnal equinox than he is in passing from the autumnal to the vernal. This well-known fact accords admirably with the "*supposed*" elliptic motion of the earth round the sun. How it accords with Mr. Mushet's and Mr. Hopkins's notion that the earth's orbit is circular, it is for them to explain. The "astounding" circumstance in this affair is that Mr. Mushet, who takes upon himself to correct, *ex cathedrâ*, all astronomers, should have been ignorant of this fact.

Kepler's "third law and base of the Newtonian philosophy remains," we are happy to learn, by the permission of the new school, "unshaken *to its proper extent;* it repeats the law of that great force of central attraction which undoubtedly gives our system its stability." But how can this be? Kepler knew nothing of this law of central attraction. His third law simply states that the squares of the periodic times of the planets, in their orbits round the sun, are proportional to the cubes of their mean distances from the sun; from which Newton, having already established in accordance with the two first laws, the truth that the planets describe ellipses in one plane, round the sun in the focus, attracted by a force varying inversely as the squares of their distances from the sun, further infers, in accordance with his calculations, that all the planets are attracted by the same *absolute* force towards the sun. How Mr. Mushet's kind patronage of Kepler's third law, to the extent he indicates, is consistent with these facts, I leave your readers to judge.

What Mr. Mushet means by the law of the great force of attraction being "perverted out of its sphere when endued with double and contrary offices, imparting mobility as well as stability at the same moment," which appears to me at present simply unintelligible, we shall no doubt learn when he or Mr. Hopkins, or both together, bring out that great work on the "True Laws of Motion," which they now fairly owe to the world.

"That a force acting from the centre of a circle in the direction of the radius should

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impart motion in the direction of the tangent, is a physical impossibility," I admit: but that when the body is already in motion in the direction of the tangent, there should be such a relation between its velocity and the central force which impresses a motion in the direction of the radius, that the velocity remains unaltered but the body is kept at the same distance from the centre, that is, in other words, that it describes a circle round the centre under the action of this force, is neither a physical impossibility nor difficult of conception.

The mode in which the new school is prepared to deal with stubborn facts is amusingly illustrated in the case of the planet Neptune.

It was first objected that it was irrelevant to go to the heavens for an illustration of so mundane a principle as the first law of motion. When, however, it is proved that the motion of Neptune is calculated on the assumption of the truth of that law, we are met with the bold assertion—"The perturbations from which the discovery of Neptune was predicted, depended on the known attraction of masses of matter; *the calculations were not in the least degree affected* by the false hypothesis upon the *cause* of their *constant* motion."

As far as I can understand what Mr. Mushet here means, and presuming that it is intended as an answer to the observations in my former letter, I may remark that the place of Neptune was calculated from the perturbations of Jupiter's orbit; this planet being supposed to describe an elliptic orbit round the sun, according to the Newtonian philosophy, *under the conditions which Mr. Mushet has been constantly repudiating.* If the *first* and *second* laws of motion were not true, as well as the "law of that great force of central attraction," the place of Neptune, as calculated on these suppositions, could not have agreed so well with his place when actually discovered, without the operation of something little short of a miracle.

We must, therefore, really impress upon our engineering philosophers that assertion is easy enough, but without proof, is of little value.

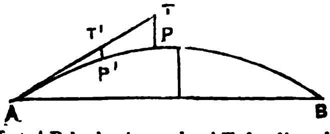
With regard to the doctrine of limits, we are here met with the same assertion of vague generalities as in every other case. Messrs. Hopkins and Mushet in their former letters seemed to make a merit of not understanding Lagrange's method of obtaining the area of a circle by "cutting off the angles of a square." Any one acquainted with the subject knows that this method of Lagrange's is an application—and a simple application, too—of the doctrine of limits. That persons who make a boast of not understanding this, are unable to, or at least do not, comprehend the doctrine of limits, is an assertion which I am sure your readers will agree with me in maintaining does not exceed the fair limits of criticism. Now, however, it appears that the practical philosophers do understand this doctrine as far as *it is "meant to be understood." Meant* by whom? and how far?

This point will, no doubt, be elucidated in the forthcoming great work to which I have alluded.

It is quite of a piece with the quality of the rest of their lucubrations for these philosophers to repudiate "metaphysics." Should they, however, ever so far overcome their repugnance as to read (say for amusement) any of our standard works—Whewell's Philosophy of the Inductive Science, for instance—they may perhaps be astonished to find how much metaphysics enter into the most elementary conceptions of the mechanical philosopher.

Accepting, however, for the nonce, the definition of metaphysics which is, in Mr. Mushet's opinion, "unexceptionable," I leave the world to judge which of the parties to the present controversy have adopted in this sense the metaphysical course; and I feel pretty sure that the verdict will most certainly not be against the old mathematicians.

Unfortunately not having by me Number 1669 of your valuable Magazine, I will, with your permission, show "Civil Engineer," by a diagram, how the motion of projectiles (*in vacuo*) is calculated, on the received theory, as I cannot help thinking there is still some serious misapprehension on his part.



Let AB be horizontal; AT the direction, and v the velocity of the body's projection. Let $AT=tv$, and $AT'=t'v$, be the spaces which, *according to the first law of motion, the body would have described in times t and t'.* Let TP and T'P' drawn vertically from T and T' be equal to $\frac{1}{2}gt^2$ and $\frac{1}{2}gt'^2$ respectively, the spaces through which the force of gravity, g, acting on the body *at rest*, would draw it in times t and t'.

Then, according to the first and second laws of motion, since the *alteration* of a body's motion is in the direction of, and proportional to, the force by which it is acted on, P and P' are the places in which the body is really found at the times t and t' respectively.

Also, since $AT=tv$, and $TP=\frac{1}{2}gt^2$, we find

$$TP=\frac{g}{2v^2}AT^2$$

which is a well known property of the parabola.

Hence AP′P, the path of the body, is a parabola.

The spaces *actually described* in times t and t' are the arcs AP and AP′.

And AP : AP′ is not as $t : t'$.

But AT : AT′ :: $t : t'$; that is, the spaces that would have been described, had gravity not acted, are *proportional to the times*.

What I presume Mr. Hopkins and "Civil Engineer" deny is, that this last proportion is true; but that, in consequence of some *inherent* tendency in the body itself, the velocity of projection v is subject to change according to some law. This, I think, fairly raises the question between us; and if it be so, it behoves those gentlemen to prove, by observation and experiment, that bodies have this inherent tendency. We shall no longer be satisfied with the bold assertion that this is the case, or with the triumphant question, How can a projectile force produce a constant motion?

Awaiting, with as much calmness and philosophy as I may, the fate I have, in Mr. Mushet's opinion, so fully challenged,

I am, Sir, yours, &c., W.

To the Editor of the Mechanics' Magazine.

SIR,—From the opening paragraphs of Mr. Hopkins's letter on page 204 of the current volume of this Journal, it would appear that he is somewhat anxious to deny what I have stated respecting Sir John Herschel's hypothesis in the passage quoted from his *Astronomy*. I would therefore refer him to page 213 of that work, where in Art. 360, the author distinctly states the condition of *free space*, and in Art. 361 he informs his readers that "henceforward, then, *in conformity with the above statements*, and with the Copernican view of our system, we must learn to look upon the sun as the comparatively motionless centre about which the earth performs an annual elliptic orbit," &c., &c. When he comes to consider the action of *gravity* in Arts. 438—455, he heads his chapter as treating of "Terrestrial Gravity," the "Law of Universal Gravitation," and the "Paths of Projectiles;" but the whole of the discussion is limited to the action of gravity as operating in *free space*. He alludes to no other force, nor does the action of any other enter into his illustrations; but, on the contrary, he quotes the *Principia* in proof of what he advances, and in referring to that work it will be seen that *free spaces* are distinctly required to be granted.

Again, if we refer to his *Physical Astronomy*, page 649, we shall find him premising the same hypothesis, for he informs his readers that he sets out by supposing the immense spaces in which the heavenly bodies revolve, to be "either completely void, or at least free from any material substance capable of sensibly resisting or impeding their motions." I am, therefore, unprepared to admit that the quotation respecting projectiles "is clearly illustrated in connection with the actual condition of things, and in accordance with the original meaning of the theory when it was first propounded." As an illustration of the action of gravity in free space the quotation is well adapted for its purpose; but most assuredly its author never expected that it would be produced against him *as a proof* that he had either misstated or misunderstood the principles on which the "practice of gunnery" is, or ought to be, founded.

I remain, Sir, yours, &c.,

T. T. WILKINSON.

Burnley, Sept. 15, 1855.

[It may be well to state here, that Mr. Hopkins is, or has been, absent from town, having had to read papers at the meeting of the British Association in Glasgow.]

CARBONATE OF IRON:—RAILWAYS.

To the Editor of the Mechanics' Magazine.

SIR,—From a late extract in your columns, it appears certain that the Somerset archæologists are not first-rate mineralogists, as they state that a *metal*, called carbonate of iron, is yearly imported from Silesia to the value of three quarters of a million sterling. What can be made of the strange inaccuracy of this confused passage? It must be a railway puff, an assertion made by and for the benefit of those who know no better. These things are to be regretted; nothing is more sad, although so common, as to see delusive statements about mineral wonders to create a monetary excitement. There has been no late discovery on the Brendon Hills. A vein of iron ore, long well known there, has the most worthless parts, a base carbonate of iron, which is by no means scarce in England. Silesia supplying us with *carbonate of iron* to manufacture steel, is sad fudge. There is a railway bill for a line over these hills; an old friend comes out in a new face to countenance the traffic, and the promoters tell the land owners, who know more of the productions of the soil than of the subsoil, that some great discovery has been made. The railway will in itself be a great benefit to the landowners, even if it does not pay a dividend within the century. All railways greatly benefit the districts through which

[redacted]

they pass; but we must always regard with great pain statements which are not true, made to delude people out of subscriptions, in the hope of profits which they will never receive. I think there is a great mistake in the way railways are often viewed as a mere pecuniary speculation to the proprietors. Good internal communications are the very life of the prosperity of a country, and roads are therefore made in new countries *at any cost*, as a *necessary*, not as an *investment*. Railway communication having once begun, it must be carried forward, whether the branches make a profit or not. Branch lines are now become as essential as cross roads, from which no one ever estimated a *profit* as an *investment*. It is the *whole nation* which benefits by the increased facilities of transit, and by the vast employment which the whole material and system supplies to all classes of the community. Were it only clearly understood and recognised, that there is little prospect of even the best railways, after their double cost in preliminaries, paying interest on original capital, the money would then be found *bonâ fide* for the good of the community at large, and not for the good of the subscribers. Persons who could afford the outlay for great public objects might then embark; but widows and orphans, and others with slender means, would not be induced to stake their all, in the belief of increasing, instead of diminishing or losing altogether, their only income.

I am, Sir, yours, &c.,

DAVID MUSHET.

September 17th, 1855.

THE MODERATOR FURNACE.

To the Editor of the Mechanics' Magazine.

SIR,—Some late inquiries induce me to state that a sectional model of one form of my patent furnace* may be seen at Watkins and Hill's, the opticians, Charing-cross. Two such sections placed together, each with its separate lever and feeding-box, form a double furnace for alternate firing, combining thus in one arrangement the three best known remedies for smoke; namely, air distributors in any required proportion to the extra demands of the gas, a graduated mode of feeding which avoids vicissitude of internal temperature and loss of heat, through setting open fire-doors, either for slow or rapid firing, *and alternate firing*, which is by some thought to be the most effectual means of all, except that it needs extra attention and care from the stoker, in ordinary furnaces, whereas in mine this attention, and the whole labour of throwing in coal is done away, and great facility afforded for cleaning the grate of clinkers. I have let this patent rest for a year. I found such a cloud of crude notions and attempts in the market when I brought it out, that when endeavouring to explain their errors and insufficiency, I was regarded as a "rival patentee," engaged in praising my own wares by depreciating those of others. I had no mind for such a conflict; it was so ridiculously foreign to my character, that I preferred in the mean explaining principles *per se*, without subjecting myself to common imputations. What I had done was new and upon sound principle; if it has sufficient elements of convenience to induce people to make a slight alteration in their grates, well and good. If anything newer or better appears, I shall be found to do justice to any "rival patentee." As the Home Secretary, whose name I conferred on it by way of characteristic discrimination, has been translated from the cure of smoky chimneys, I must find a new designation; and perhaps the title, "Moderator Furnace" will very well express the capacity for a simultaneous regulation of the *flow* of air and coal.

I am, Sir, yours, &c.,

DAVID MUSHET.

September 18th, 1855.

* See *Mechanics' Magazine*, No. 1624, page 299.

EXPANSIVE MARINE ENGINES.*

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Mushet makes some rather startling assertions in his last letter (No. 1674, page 230), in respect to steam engines and valves, upon which a few remarks are perhaps necessary. He refers Mr. Allen and myself to your Magazine for a part of the year 1847, and from which I at once infer that he considers Craddock's engine as possessing all the advantages desired by Mr. Allen. I should have thought that after the lengthy discussions that have taken place in most of our scientific journals, respecting Craddock's engine, your correspondent would not have been so confident in his assertions respecting its merits. Mr. Mushet states, that by referring to your Magazine we shall find, in connection with the engines, a means of generating steam of a high pressure in perfect safety, a claim not possessed by any other boiler in existence. Most of your readers will, I think, admit that this assertion is rather startling, and I would ask, by what means has Mr. Mushet arrived at this conclusion, when it is well known that locomotive and various other boilers are capable of sustaining a pressure of 200 lbs. to the square inch, and that with perfect safety? Your correspondent also states that I shall find in your pages valves of a greater simplicity of construction than I seem to be as yet aware of.

* This letter should have appeared in our last number.—ED. M. M.

If he means Craddock's valve, I would request that he would be so kind as to point out its greater simplicity and advantage over the combination of valves suggested by me. By the use of two valves, as I proposed, the engine could be worked by hand, a thing which cannot be done in Craddock's engine when the valve is of a large size.

I am, Sir, yours, &c.,
JOHN TRURAN.

ATLANTIC STEAMERS.

To the Editor of the Mechanics' Magazine.

SIR,—In a very interesting paper on ocean steamers, written by Mr. Prosser, C.E., New York, and published in the August number of your valuable Magazine, *The Great Western* is mentioned as the *first boná fide* steamer FROM England across the Atlantic without touching at any intermediate port, (vide page 151). This assertion is doubtless correct; but it might lead to the misapprehension that no steamer had crossed TO England previously, an error it may be as well to correct—*The Royal William* was in every respect a *boná fide* paddle-wheel steamer; she was built at Quebec, and ran between that port and Halifax from 1831 to 1833; during the fall of the latter year she ran straight across to Falmouth, and was immediately sold to the Portuguese Government, under the name of the *Donna Isabella;* to her therefore belongs the honour of the first transit across the Atlantic, though *The Great Western* may fairly lay claim to being the pioneer in *oceanic communication*, being the first vessel built for that special purpose.

If these remarks are of sufficient interest, I shall feel obliged by your insertion of them in your useful columns.

I remain, Sir, yours, &c.,
HENRY A. MURRAY.

London, Sept. 14, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

MURRAY, BARNABY ANGELO, of Dublin, professor of languages. *Improvements in winding, doubling, and twisting silk, flax, and other fibrous substances.* Patent dated February 24, 1855. (No. 409.)

Claim.—1. The combination of winding silk direct from the cocoon, with the twisting of the fibre by spinning from the reels. —2. An arrangement of reels and guides in such manner as to impart a twist to the yarns from the giving off reels, and to those on the taking up reel simultaneously, but in opposite directions. — 3. The operation of doubling and twisting yarns, and producing *threads, by causing* the bobbin carriage and the taking-up reel both to spin, but in a direction contrary to that of the bobbin.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in fountain pens.* (A communication.) Patent dated February 24, 1855. (No. 410.)

This invention mainly consists in the use of a spring or tongue fixed in the feeding-tube of a fountain-pen, for the purpose of keeping up a constant supply of ink to the pen by the vibration of the same during writing.

WHITE, JOHN HAINES, of Manchester, Lancaster, dentist. *An improvement in the method of applying artificial teeth.* Patent dated February 24, 1855. (No. 411.)

This improvement relates to such artificial teeth as are affixed to a palate, and applied without the aid of springs, and consists in producing a roughened surface thereon, constituting a number of small projecting points for the purpose of gaining adhesion to the skin.

RUSSELL, JOHN SCOTT, of Millwall. *An improvement in the construction of ships or vessels to facilitate the use of water as ballast.* Patent dated February 24, 1855. (No. 413.)

This invention consists in constructing a ship or vessel with a central or midship compartment or hold, formed by strong transverse water-tight bulk-heads, and closed in at top with an iron deck, either covered or not with wood, having, however, a hatchway capable of being closed water-tight.

BROWN, WILLIAM, of Albany-road, Old Kent-road, Camberwell, Surrey, engineer. *Certain improvements in machinery for printing.* Patent dated February 26, 1855. (No. 414.)

This invention relates—1. To the use or application of a parallel motion for the purpose of causing the surfaces of the table or platten to move parallel with each other. 2. The use of a carriage and combination of levers for giving motion to the inking rollers. 3. The arrangement of the machine with a pinion ratchet and spur-wheel for feeding it with paper, card, or other material.

MARTIN, HAMILTON, and JOSEPH SMETHURST, of the Guide Bridge Iron Works, near Manchester, engineers. *Improvements in the construction of fences or casings for shafts, pulleys, and other parts of machinery.* Patent dated February 26, 1855. (No. 415.)

This invention consists in making such fences or casings of semi-circular troughs, to which discs or semi-discs are attached, for closing the ends of the drums or wheels fixed on the shafts to which such fences or casings are applied.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Certain*

[redacted]

improvements in the application of breaks on railways. (A communication.) Patent dated February 26, 1855. (No. 416.)

This invention relates to the operation of the brakes of a single carriage, or of all the brakes of a train, by means of the momentum of the carriage or train, acting so as to cause a chain or cord to be wound up on a barrel and simultaneously act upon them.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Certain improvements in the manufacture of soda.* (A communication.) Patent dated February 26, 1855. (No. 418.)

"Instead of submitting the bicarbonate to a certain lixiviation," says the patentee, "it is better to submit the drained bicarbonate to a great pressure, by which means the major part of the liquid is extracted. If, after this first pressure, the bicarbonate of soda be calcined, a salt of soda is obtained that will mark from 84° to 85° by the alkalimeter, &c."

BROWN, ALEXANDER, of Tarbet, Dumbarton, engraver. *Improvements in the manufacture of paper, and in the production of textile materials.* Patent dated February 26, 1855. (No. 420.)

Claims.—1. "The application and use of the fern, or bracken plant, or plants comprehended under or within the cryptogamic series, for the obtainment of fibrous materials to be used for the manufacture of paper. 2. The application and use of the fern or bracken plant, or plants comprehended under or within the cryptogamic series, in the manufacture or production of textile materials."

ROBERTS, CHARLES HENRY, of Cornwall-road, Lambeth, Surrey. *An improvement in the manufacture of rubbers for painters and others.* Patent dated February 26, 1855. (No. 421.)

This invention consists in the use of ground pumice stone in the manufacture of artificial rubbers, in place of employing pumice stone in the natural state.

NASH, THOMAS, junior, of Great Dover-road, Newington, Surrey, brush manufacturer. *Improvements in painting-brushes, applicable also to other brushes and to brooms.* Patent dated February 26, 1855. (No. 422.)

Instead of using string, wire, or other ordinary binding for painting or painters' brushes, the inventor binds the bristles, hairs, or other materials forming the brush, firmly to the handle, "by means of a webbing of linen, flax, or other material of the required strength and pliability."

GILBEE, WILLIAM ARMAND, of South-street, London, gentleman. *An improved soap, to which he gives the name of saponitoline.* (A communication.) Patent dated February 27, 1855. (No. 424.)

In carrying out his invention the inventor places in a copper 88 gallons of soft water, and mixes with it 112 lbs. of crystal soda or 79 lbs. of salts of soda, and after two or three hours have elapsed, agitates it and adds 112 lbs. of common soap. He then heats the whole to 40° or 45° centigrade, and adds 17 lbs. of pearlash, and 17 lbs. of quick lime. When ebullition has commenced in the copper he slowly agitates the liquid mass, and pours into it about 5 gallons of mucilage of linseed, or marshmallow seed, after which he adds 7½ pounds of borax, or about 2½ pounds of calcined alum. When the whole is well mixed in the copper, and the liquid presents the appearance of being perfectly homogeneous, he leaves it to boil on a slow fire for ¾ of an hour. The fire is then extinguished, the copper covered over, and the temperature allowed to fall to 55° or 60°. He then pours the liquid into barrels where it becomes solidified in about 24 hours (supposing that hard soap has been used); if otherwise, it remains in a gelatinous state.

BRODIE, JAMES, of Bow of Fife, North Britain, clerk. *Improvements in, and applicable to, tongs, pliers, vices, and other holding instruments.* Patent dated February 27, 1855. (No. 425.)

This invention consists in applying to various kinds of holding and pressing instruments certain parts called "holders," or in otherwise constructing the instruments in such manner as to ensure a more equable distribution of the pressure on the substance or article that is held or pressed.

FOTHERGILL, BENJAMIN, engineer and machinist, and WILLIAM WEILD, engineer, of Manchester, Lancaster. *Improvements in machinery for combing cotton, wool, flax, silk, and other fibrous materials.* Patent dated February 27, 1855. (No. 429.)

This invention is supplementary to a previous patent of Messrs. Fothergill and Weild, dated April 11, 1854 (No. 854), and consists—1. In giving to the detaching rollers of the machines referred to a reverse as well as a forward movement for each detachment of fibres, by which means a better joining of the combed fibres, and a sliver of more body or substance are obtained. The patentees accomplish this by substituting for the intermittent motion described in the specification of the patent above-mentioned any of the well-known forward and reverse motions used in Heilman's combing machine. The invention consists—2. In the use and adaptation of a wire (stretched behind the detaching rollers) or other instrument to which the requisite movements are imparted, by a can or other equivalent arrangement, for the purpose of placing the tail ends of each detachment of fibres protrud-

ing from the detaching or nipping rollers in the most favourable position for effecting junction with the head ends of the fibres next to be detached.

CAMPION, WILLIAM, of Nottingham. *Certain improvements in knitting machinery.* Patent dated February 27, 1855. (No. 430.)

This invention consists in so arranging and constructing knitting machinery that the inventor is enabled thereby to narrow the work, by traversing loops from one, two, or more needles, at each end of a course, on to other needles.

BLAKELY, ALEXANDER THEOPHILUS, of Little Ryder-street, St. James's, Middlesex, captain of the Royal Artillery. *Improvements in ordnance.* Patent dated February 27, 1855. (No. 431.)

This invention consists—1. In forming ordnance by surrounding a tube of cast iron or steel with wrought iron. 2. In forming heavy ordnance by casting iron rings on such a tube. 3. In strengthening old guns by means of external rings shrunk upon them. 4. In employing the friction produced by the passage of oil or other fluids through a small passage, in combination with the use of compressed air, for the purpose of moderating the recoil of guns. 5. In applying the last arrangement to mortars. 6. In forming guns of layers of iron between which are placed layers of lead.

HELLIWELL, THOMAS, of Greenhirst Hay, near Todmorden, York, cotton-spinner and manufacturer, and JOSEPH BARKER, of Houghstone Mill, near Todmorden, manufacturer. *Preserving pickers and picker-sticks, and for preventing cops being knocked off the spindle in the shuttle during the process of weaving in the power-loom.* Patent dated February 28, 1855. (No. 432.)

This invention consists in the use of a spring of steel, wood, or whalebone affixed behind the back guard of the shuttle-box, such spring being attached at each end to buffalo hide or leather, the other end of which is, by means of a hole therein, put round the sirspindle of the shuttle-box. The buffalo hide or leather form a buffer, bringing the shuttle gradually to rest, and preventing the picker and shuttle from going too far in the box, as well as assisting in returning the shuttle and giving it increased action.

SYMONS, ALEXANDER, of the Strand, Middlesex, gentleman. *An egg-cooking apparatus.* (A communication.) Patent dated February 28, 1855. (No. 433.)

The inventor proposes to employ a portable metallic vessel heated by a lamp, the bottom of which vessel is of such a form and size internally as to contain but a small quantity of water, which, being gradually converted into steam by heat applied externally, is sufficient for the purpose required.

BRICKLES, JESSE, and THOMAS THORPE, manufacturers, and JOSEPH LILLE, engineer, of Manchester. *Improvements in the manufacture of plain and ornamental woven fabrics.* Patent dated February 28, 1855. (No. 436.)

This invention consists in constructing the warp or weft, or both warp and weft, of woven textile fabrics, whether plain or ornamental, of yarns or threads twisted in contrary directions, the whole or part of such yarns or threads having more than the usual amount of twist, for the purpose of producing fabrics having craped or crimped surfaces.

HIGGIN, JAMES, of Manchester, Lancaster, manufacturing chemist. *Improvements in treating certain waste soap liquors, and obtaining therefrom certain products applicable to purposes not hitherto known.* Patent dated February 28, 1855. (No. 437.)

Claim.—"Separating from waste coloured soap solutions a colouring fatty substance, and diluting the same with a finely-powdered or fibrous substance, so that, when the said mixture is used in dyeing, the fat will remain combined with the powdered substance, and be incapable of staining the whites."

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *An improved mode of ringing fog-bells.* (A communication.) Patent dated February 28, 1855. (No. 439.)

Claim.—The application of electro-magnetic power to the ringing of fog-bells, as described, whether they be used on shipboard or upon or near to reefs, shoals, or other places dangerous to navigators.

GEDGE, JOHN, of Wellington-street South, Middlesex. *Improvements in apparatus or machinery for stopping or retarding vehicles used on railways.* (A communication.) Patent dated February 28, 1855. (No. 440.)

This invention consists of an arrangement of apparatus for detaching the passenger-carriages from the engine.

MILLER, GEORGE MACKAY, of Inchicore, Dublin, civil engineer, and JOHN WAKEFIELD, of the same place, engineer. *Improvements in pistons for engines driven by steam or other elastic fluid, which improvements are also applicable to the pistons or plungers of reciprocating pumps.* Patent dated February 28, 1855. (No. 441.)

Claim.—The construction of the piston so that water or steam or other elastic fluid can be applied in such manner as to press on the inner surface of the packing-rings, so as to expand them.

WILSON, FISCHER ALEXANDER, of Kennington, Surrey, gentleman. *Improvements in closing and unclosing bottles, and other*

ls used for containing liquids, also in the s of inserting, securing, and liberating ls therein and therefrom. Patent dated uary 28, 1855. (No. 443.)

iis invention mainly consists in the use a single hollow plug or stopper, fitted one or more valves or lids, to be ed, closed, and secured by means of one iore springs, screws, levers, or slides; . there are more than one valve or hey are so arranged as to be capable of ; opened, closed, or secured simulta-ily or separately, as may be required, aid hollow plug or stopper being also ole of being fastened to the vessel (but to be removed when necessary), or to an integral part of the said vessel."

NNINGS, HENRY CONSTANTINE, of t Tower-street, London, practical che- *An improvement in the manufacture of* Patent dated February 28, 1855. 445.)

is invention consists in manufacturing when resin is employed by proceeding llows:—"I saponify," says the in-r, "a quantity of tallow, or fat, or oil, caustic alkali, in the usual manner, roduce as pure and hard curd soap as ole; to this I add a large proportion lophane (prepared according to a for-patent granted to me), I also add two ore per cent. of bicarbonate of soda, or of commerce, and also about one or per cent. of sulphate of alumina, ion alum, or other soluble salt of alu-and I boil the whole with water until nplete or perfect combination is pro-. The soap is then fitted and framed usual manner."

OK, THOMAS, lieutenant, R.N., pro- of fortifications, of Addiscombe, y. *Improvements in working punkas pparatus for agitating air in churches, als, and other buildings.* Patent dated iary 28, 1855. (No. 446.)

e inventor connects all the punkas in row by a horizontal rod, which passes gh mortises in the vertical rods by . the punkas are suspended, in such er that any one punka may be de-l from the others, at pleasure, without ing their motion.

ACKBURN, BEWICKE, of Clapham-ion, Surrey. *Improvements in the ma-ure of pipes.* Patent dated February 855. (No. 449.)

im.—The manufacture of pipes, by ying thin pieces of wood, bent spirally rossing each other diagonally, the in-es being filled up, and the whole of amework cemented together by as- or other suitable cement.

OOMAN, RICHARD ARCHIBALD, of 166, street, London, patent agent. *An improvement in rollers used in spinning.* (A communication.) Patent dated March 1, 1855. (No. 450.)

In the spinning of cotton wool and other fibrous materials, rollers covered with cloth and leather are employed. After being used some time these rollers become useless from the leather losing its polish and lustre. This invention consists in maintaining the leather in its desired state of polish by coating it with albumen or other such matter dissolved in water.

VIGOUREUX, STANISLAS, manufacturer, of Rheims, French empire. *Certain improvements in printing, ornamenting, and dressing woven and textile fabrics.* Patent dated March 1, 1855. (No. 452.)

This invention relates to certain means of printing, ornamenting, and dressing woven and textile fabrics, with the aid of steam and pressure.

SADLEIR, THOMAS, of Mulla Tullamore, esquire. *An improved apparatus and method of manufacturing charcoal, which can also be applied to cooking and other purposes.* Patent dated March 1, 1855. (No. 453.)

The object of this invention is to char the peat, &c., by rapid instead of by slow combustion: the boiler is set or fixed between the two kilns, which are separated from each other by a thin division in the middle of the bottom of the boiler, and as they are lighted alternately, at comparatively short intervals, one half of the boiler is constantly acted on by the heat. By this arrangement the charring of the peat, &c., can be carried on simultaneously with the boiling of water and the generation of steam.

MILLER, GEORGE MACKAY, of Inchicore, Dublin, civil engineer. *Improvements in axles and axle-boxes of engines and carriages in use on railways.* Patent dated March 1, 1855. (No. 454.)

This invention consists—1. In fitting the cylindrical journals of axles with one collar only instead of two, in order to reduce the friction. 2. In constructing axle-boxes so that the main portion of the same, and the step or bearing for the axle-journal, can be removed without lifting the carriage off the wheels. For this purpose the lower part of the axle-box is made open at the top, in order to receive the step or bearing, and that portion of the box which forms the upper grease chamber or hopper.

SMALL, ANDREW, of Glasgow, Lanark, ship chandler. *Improvements in marine compasses, and in apparatus applicable thereto.* Patent dated March 1, 1855. (No. 455.)

Claims.—1. A general arrangement and construction of marine compasses, as described. 2. A mode of effecting the corrective adjustment of marine compasses by

means of fore and aft and athwart-ship adjustable magnets. 3. The application and use of one or more adjustable corrective magnets on each of the four sides of the binnacle case, for counteracting the deflection or derangement of the indicating compass needle. 4. The application and use of opposed or opposite corrective magnets, disposed one above and one below the compass needle's level. 5. The application and use of vertical or segmental graduated scales for indicating the set or adjustment of the corrective magnets. 6. A mode of effecting the proper corrective adjustment of the shifting magnets for the ship's inclination by the aid of a pendulous index and segmental scale. 7. The application and use of a dumb compass card and sight apparatus for obtaining the sun's azimuth and altitude. 8. A mode of ascertaining the whole error of the indicating compass needle, by means of a dumb compass card, and adjustable stile, and graduated latitude and hour or time scales.

Lowry, George, of Manchester, machinist. *Improvements in machinery for preparing and spinning flax, hemp, and other fibrous materials.* Patent dated March 2, 1855. (No. 460.)

Claim.—Certain improvements whereby a comb or combs is made to strike into and leave fibrous material when in a state of tension; also, making the pins of combs near together near the delivery roller, and farther apart near the feed roller.

Duméry, Constant Jouffroy, of Rue du Chateau d'Eau, Paris, France, civil engineer. *Improvements in alarm and safety whistles for steam generators.* Patent dated March 2, 1855. (No. 461.)

The apparatus described by the inventor consists of a chamber or box provided with a hollow column bearing the whistle, a float being placed within the chamber or box, the lower part of which communicates with the water in the boiler, so that as the float falls the steam may ascend within the hollow column, and sound the whistle.

Hodges, William, of Stafford, boot and shoe-manufacturer. *Certain improvements in boots and shoes.* Patent dated March 2, 1855. (No. 464.)

Claim.—The use of the combined arrangement of an elastic medium (either at the front or side of the boot or shoe), such as India-rubber, web, or cloth, together with an elastic cord or lace.

Johnson, John, of Bow, Middlesex, drysalter. *Improvements in temporary rudders.* Patent dated March 2, 1855. (No. 465.)

The inventor constructs two or more straps of wrought iron, each composed of two side bars connected by a transverse bar, the outer ends of each of the side bars being made with a screw thereon, to receive a screw-nut or nuts, or holes for keys or cotters. The ends of these side bars pass through holes at the end of another bar or plate, by which means is produced a quadrangular frame or strap suitable for receiving, and having fixed therein, pieces of yards, spars, or other wood to form a spare rudder.

Taunton, William George Henry, of Liverpool, Lancaster, civil engineer and patent windlass - purchase manufacturer. *Improvements in pumps, pump-gear, and pump-buckets.* Patent dated March 2, 1855. (No. 466.)

This invention consists in enlarging the barrel of the pump above the lower valve, so as to form a spherical, egg-shaped, or other conveniently-formed chamber, between the lower valve and the lowest point which the spear valve reaches in its downward stroke.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Player, Joseph, John Phillips Player, and Luke Duncan Jackson, of Winchester, builders. *Machinery or apparatus for drying tan, peat, and such like substances.* Application dated February 24, 1855. (No. 412.)

The principal feature of this invention consists in arranging and disposing certain receptacles around and about the periphery of the cylinder or case in which the fan of an ordinary fan-blast machine rotates, and in perforating the surface of this case, or in forming the same of wire gauze.

André, Pierre, merchant, of Paris. *Certain improvements in grinding mills.* Application dated February 26, 1855. (No. 417.)

In carrying out this invention, the whole apparatus is arranged in such manner that the mill spindle which carries a certain grinding plate may be adjusted to the proper height by means of levers, screws, &c., motion being given by any suitable means. The bed stone is also adjustable to suit the grinding plate and the material to be ground.

Spurway, James William, of Monmouth-place, New Cross, Deptford. *A travelling pass.* Application dated February 26, 1855. (No. 419.)

The inventor proposes to substitute metallic passes for the paper tickets used for passengers by rail, boat, &c.

Gilbee, William Armand, of South-street, London, gentleman. *An improved process of manufacturing alcohol from the stem and ear of maize.* (A communication.) Application dated February 26, 1855. (No. 423.)

[redacted]

The inventor cuts the plant into small pieces, and crushes them so as to form a kind of pulp which is submitted to fermenting and distilling processes.

BERCHTOLD, ALFRED JEAN, engraver, of Paris, French empire. *Certain improvements in applying the photographic engraving on metals or other materials.* Application dated February 27, 1855. (No. 426.)

"I take a negative or positive photograph," says the inventor, "either on paper, or on collodion, or albumen, or other suitable material, and I produce a grain upon this photograph, by printing the grain in black, or any other colour, upon it, from a plate, or block, or other printing surface, or by perforating or making strokes, lines or slots upon it, by a roller or other instrument worked by the hand or by machinery. The design is then transferred by the action of light to a varnished surface of metal or stone, or other suitable material, by the process already known, and the varnish is afterwards treated by solvents, and the surface etched by acid."

GARDNER, HENRY, of Arthur-street, Old Kent-road, Surrey, gentleman. *Certain improvements in the construction of horseshoes, and in shoes used for the shoeing of hoofed animals.* Application dated February 27, 1855. (No. 427.)

This invention mainly consists in connecting horseshoes to the hoofs of horses by means of screws, the heads of which are long enough to project below the shoes when screwed tight, and thus raise the shoes from the ground.

COOPER, JOSEPH, of Lionel-street, Birmingham, Warwick, brace and bit-manufacturer. *Certain improvements in joiners' braces, and in the mode of forming or partially forming the various bits to be used with such or any other kind of brace.* Application dated February 27, 1855. (No. 428.)

This invention comprises an alteration in the form of the spindle or mount which unites the head to the stock, and on which the head works. This spindle is of a parabolic form, curving outwards at the base, for the purpose of giving a proper bearing to the neck, and equalizing the friction from the pressure and action on the head, while in use. Also the use of a screw-pin to be placed in the front or side of the stock, just below the base of the spindle or mount, for the purpose of better securing the same to the stock, &c.

ALLARTON, FREDERIC, of High-street, Southwark, Surrey, chemist. *Certain improvements in the method of administering iron as a remedy.* Application dated February 25, 1855. (No. 435.)

This invention consists in combining with the usual materials used in the manufacture of biscuits, and other similar articles of food, any of the oxides or salts of iron.

HOLROYD, WARD, of Queen's Head, near Halifax, York, manager. *An improved method of fencing horizontal and other shafts in factories and other places where such fencing may be required for the purpose of preventing accidents.* Application dated February 28, 1855. (No. 438.)

This invention consists in forming a fencing or casing in two parts, longitudinally jointed together, and so shaped that it will encircle the shaft and fit loosely thereon, so as to be capable of being adjusted in such manner that it may turn with, and by the friction of, the shaft, except when acted upon by any outward pressure or resistance, whereby it is immediately brought to a state of rest allowing the shaft to revolve within it.

GOODE, BENJAMIN WILLIAM, of Birmingham, Warwick, manufacturer, and NEHEMIAH BROUGH, of Birmingham, machinist. *A new or improved fire-arm.* Application dated February 28, 1855. (No. 442.)

In loading this fire-arm, the charge is introduced into a portion of the barrel which is situated near the breech, and which rotates on an axis so as to be turned aside from the barrel itself in order to receive the charge, after which it is turned back so as to bring it into a line with the barrel, where it is fastened.

BELLHOUSE, EDWARD TAYLOR, of the Eagle Foundry, Manchester, Lancaster engineer, and THOMAS COWBURN, of the same place, engineer. *Improvements in vacuum valves and safety valves.* Application dated February 28, 1855. (No. 444.)

This invention relates to certain peculiar constructions and arrangements of oscillating safety and atmospheric valves, and consists, according to one modification, of a compound vacuum and float valve, which is opened, and allows the steam to escape from the boiler, or atmospheric air to enter the same, if a vacuum be formed therein, as soon as the level of the water in the boiler becomes dangerously lowered.

RITCHIE, GEORGE, of New Cross, Deptford, Kent. *An improvement in the manufacture of linings for articles for dress.* Application dated February 28, 1855. (No. 447.)

This invention consists in producing double fabrics, either by weaving, as is well understood, or by sewing two fabrics together at intervals, in such manner that each double fabric may consist of numerous narrow parallel hollow compartments, which, being filled with ground or pulverized cork, are to be made up into linings for articles of dress.

PENNEY, HENRY, of York-place, Baker-street, Portman-square, Middlesex, varnish-maker. *An improved mode of treating vulcanized or cured India-rubber.* Application dated February 28, 1855. (No. 448.)

The inventor cuts up the material into small pieces, and steeps it in coal-tar, naphtha, or other solvent of India-rubber, in order to swell it. When the material has thus been deprived of its elasticity, he removes it from the naphtha or other spirit, and drains or dries it. He next submits it to heat, and thereby reduces it to a fluid state; when the naphtha is completely driven off, it may be moulded as desired.

RAMSBOTTOM, JOHN, of Accrington, Lancaster, engineer. *Improvements in steam engines, and obtaining motive power more economically.* Application dated March 1, 1855. (No. 451.)

This invention mainly consists in "the application of steam or other vapour or fluid at the termination of the stroke to both sides of a piston, to equalize pressure or resistance, in order that the expansive force may be rendered further effective for obtaining motive power," and in "the abstraction of steam from a cylinder expansively (in which its reactive pressure is counteracted as before described) and the application of the said steam to another cylinder or cylinders, for the purpose of making its expansive force further available for obtaining motive power."

KENNEDY, THOMAS, of Kilmarnock, Ayr, gun-manufacturer. *Improvements in wadding for fire-arms.* Application dated March 1, 1855. (No. 456.)

This wadding may be made of various materials, as leather, pasteboard, wood, or other cheap and partially elastic or soft substances. The wadding described by the inventor is cupped or dished, and pressed upon one end of the shot, which, with its encircling wadding, then resembles an egg in an egg cup, the interior of the wadding being made to fit the front part of the shot, whilst the exterior of it fits closely to the bore.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for rolling and shaping metals.* (A communication.) Application dated March 1, 1855. (No. 457.)

This invention consists in combining an ordinary plain roll, or a roll slightly modified in form according to circumstances, with a block or plate running on a centre, and having a groove or slot formed in its surface corresponding in curvation and shape to the article required.

LEWIS, JAMES, of Abergavenny, Monmouth, ironmonger. *Improvements in stench-traps.* Application dated March 2, 1855. (No. 458.)

These improvements consist in making stench-traps self-acting and self-cleansing. To the bottom of the box-grating, suspended upon pivots, or otherwise, is a moveable pan, having a projecting lever, on the outer end of which is placed a counterbalance weight, so adjusted as to keep the pan, when full of water, in a horizontal position, by which means the lower orifice of the box-grating is effectually trapped and the escape of vapours prevented.

DODDS, THOMAS, and RICHARD LEAKE, of Horseshoe-court, Ludgate-hill, London, lithographers, and WILLIAM FLETCHER, of St. James's-street, Old Kent-road, London, engineer. *Certain improvements in the construction of a machine for heating all kinds and descriptions of furnaces with coal or other gases.* Application dated March 2, 1855. (No. 459.)

In carrying out this invention the gas is led from the main cock through a number of pipes to burners, where it is lighted, air being supplied through a door and a suitable tube.

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *An improved drill and bit-stock.* (A communication.) Application dated March 2, 1855. (No. 462.)

This invention "consists in so constructing the drill-stock that by means of a reciprocating motion of the handle a continuous rotatory motion in one direction is given to the drill or bit."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in slide-valves for steam engines.* (A communication.) Application dated March 2, 1855. (No. 463.)

According to one arrangement comprised in this invention the back of the slide is fitted with a metallic packing frame or plate, which is held in its place by projecting flanges cast on the back of the slide, and by moveable end pieces screwed to the sides of the slide. This packing-piece moves with the valve, and is kept pressed against the valve-chest cover, or against a plate inserted into such cover, by suitable springs attached to, or carried by, the slide.

PROVISIONAL PROTECTIONS.

Dated August 15, 1855.

1847. Louis Auguste Pouget, lamp manufacturer, of Paris, France. Improvements in moderator-lamps.

1849. George Napier, of Renfrew-street, Glasgow, Lanark, and of Adelphi, Middlesex, engineer. Constructing furnaces for marine and other boilers as well as for other furnaces, together with the apparatus employed therein for the purpose of heating the air previous to entering the furnace or furnaces, and for consuming the smoke and the saving of fuel.

1851. John Avery, of Essex-street, London. An improved apparatus to be applied to drawers to secure them, and to give notice when any attempt is made to open the same by any improper person. A communication.

1853. John Barber, of Manchester, Lancaster, engraver to calico printers. Certain improvements in steam-engines.

Dated August 16, 1855.

1855. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in Jacquard machines. A communication from C. Vai and G. Bernardi, of Turin.

1857. Thomas Williams, of Liverpool, Lancaster, gun-maker. Improvements in breech-loading fire-arms, and in the mode or method of loading the same.

1859. Andrew Shanks, engineer, of Robert-street, Adelphi, Westminster. Certain improvements in machines for cutting or shaping nuts.

1861. Charles Rowley, gentleman, of Birmingham, Warwick. Improvements in elastic bands.

1863. Samuel Monk, engineer, of Bridge-street, Smethwick, Stafford. Improvements in bricks for draining, sewering, and other purposes.

1867. William Emerson Baker, of Cannon-street West, London, gentleman. Improvements in sewing machines. A communication.

Dated August 17, 1855.

1869. Joseph Fenton, of Lancaster. A guard or apparatus to be used with moderator-lamps.

1871. George Collier, of Halifax, York. Improvements in weaving plush by power, parts of which improvements are applicable when weaving other fabrics.

Dated August 18, 1855.

1873. Edward Heys, of Great Jackson-street, Hulme, Manchester, pawnbroker. Improvements in flyers used in preparing and spinning cotton and other fibrous materials.

1877. Alfred Savage, of Eastcheap, London, machinist. Improvements in the means or mechanism for treating tea, sugar, coffee, chicory, and such substances as require the processes of separation, reduction of size and mixing, or any one or two thereof.

Dated August 20, 1855.

1879. Alphonse René Le Mire de Normandy, of Judd-street, Brunswick-square, Middlesex, analytical chemist. Certain improvements in the manufacture of soap.

1881. Alexander Bain, of Westbourne-park-road, Paddington, Middlesex. An instrument or apparatus for distributing liquids.

1883. William Soelman, of Bennett-street, Fitzroy-square, Middlesex. Improvements in the construction of propellers.

1885. Henry Knighton, of Stamford, carpenter and joiner. An improved construction of portable drill.

1887. John Harcourt Brown, of Trafalgar-square, London. Improvements in the construction of ball-cartridges for facilitating the loading and lubricating of fire-arms.

Dated August 21, 1855.

1889. George Lewis, of High Cross-street, Leicester, locksmith. The making of taps and cocks of glass.

1891. John Cornes, of Swan-lane, London, engineer. An improved method for consuming smoke.

1893. James Orange, of Nottingham, engineer. Improvements in apparatus for covering yarns or other cores.

1895. Edward Field, of the Coal-yard, Drury-lane, engineer. Improvements in presses or machinery for embossing and colouring.

Dated August 22, 1855.

1897. Dupont de Bussac, of Brussels. The combination of hydriodic acid, watery or oily, or salts of iodine with tannic acid, the constituting parts of cinchona, or of sarsaparilla, or of the leaves of the walnut tree and iron, or with one or several of these bodies.

1899. Michel Blum, of Ilzach, Ht. Rhin, France, tailor. An improved hood.

1901. Jacob J. Lownds, of New York, United States of America. An improved extension pen and pencil-case.

Dated August 23, 1855.

1903. Jules Théodore Alexandre Zinkernagel, mosaic-maker, of Paris, France. Improvements in the manufacture of mosaic-work.

1905. Wright Jones, of Pendleton, Lancaster, engineer. Improvements in machinery or apparatus for printing woven fabrics and paper-hangings.

1907. Victor Fouchier, of Rue de l'Echiquier, Paris, France, gentleman. Improvements in constructing and preparing mill-stones.

1909. Joseph Gilbert Martien, of Newark, New Jersey, United States. Improvements in preparing certain oxydes of iron for use, and for apparatus to be used therein.

1913. Thomas Bartlett, civil engineer, of Chambery, Savoy, Sardinia. Improvements in machinery for drilling or boring into stone.

Dated August 24, 1855.

1915. William Wood, of Monkhill, near Pontefract, York. Improvements in the manufacture of pile and other fabrics.

1917. William Smith Gooding, of Manchester, Lancaster. A tailor's clay-cutter.

1919. Toussaint Auguste Radiguet, civil engineer, of Longjumeau, French empire. An improved dynamical apparatus for motive power.

1921. C. Schlickeysen, of Berlin, Prussia, machinist. Improvements in machinery for manufacturing pipes, bricks, and tiles.

Dated August 25, 1855.

1923. John Avery, of Essex-street, London. Certain new and useful apparatus for exhausting and closing vessels. A communication.

1925. John Avery, of Essex-street, London. Improvements in sewing-machines. A communication.

1927. Charles Frederick Stansbury, of Gracechurch-street, London. An improved mill for grinding. A communication from Amory Felton, of Troy, New York, United States.

1929. Eugene Carless, of the East London Works, Mile-end, Middlesex. Improvements in the manufacture of artificial leather suitable for bookbinding and other purposes.

Dated August 27, 1855.

1932. François Rualem, of Rue de Paris, Belleville, France, milkman. A new process for manufacturing fuel for household and general purposes, called "the imperial coal."

1933. Celse Eugène Capron, of South-street, London, gentleman. An improved cupping apparatus.

1934. John Woordswoorth Robson, of Grundy-street, Poplar New Town, Middlesex, engineer. Improvements in water-closets.

1935. Thomas Alexander Cooling, of Temple-chambers, Whitefriars. Improvements in pumps.

1936. Charles Humfrey the younger, of Terrace, Camberwell, Surrey. Improvements in the manufacture of fatty and oily acids.

1937. Emile Constantin Fritz Sautelet, manufacturer, of Paris, French empire. An improved impermeable cloth or fabric for sheltering, covering, and preserving in various purposes.

1938. James Smith, of Bristol, surgical instrument-maker. Improvements in children's carriages or perambulators, and invalid carriages.

1939. Samuel Ludbrook, of Mile-end, Middlesex, manufacturer. Improvements in railway-wheels.

1940. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in machinery or apparatus for rolling or shaping metals. A communication from Jackson Brothers, Petin, Gaudet, and Co., of Rive de Gier, France, engineers.

1941. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in railway-breaks. A communication from Dominique Didier, of Voiron, France.

1942. Charles Humfrey the younger, of Terrace, Camberwell, Surrey. The application of certain products of fatty and oily matters to the manufacture of candles and other uses.

1943. Charles Esplin, of Windmill-street, Church-street, Lambeth. Improvements in apparatus for regulating the supply of gas.

1944. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in separating substances of different specific gravities. A communication.

1945. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in percussion-guns. A communication from Comte Pierre Beltrami, of Paris.

1946. Benjamin Moore, of New York, United States, and Regent-street, Middlesex. Improvements in sewing-machines. A communication.

Dated August 28, 1855.

1947. Joseph Hopkinson, junior, of Huddersfield, York, engineer. Improvements in furnaces.

1948. Edward Newman Fourdrinier, of Percy-circus, Pentonville. Improvements in machines for cleaning table-knives.

1949. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in umbrellas. A communication.

Dated August 29, 1855.

1950. James Booth, of Manchester, engineer. Improvements in machinery for drilling and boring.

1952. Charles Frederick Stansbury, of Gracechurch-street, London. An improved seed-planter. A communication from Edgar M. Stevens, Joseph B. Crosby, and J. W. Pearson, of Massachusetts, United States.

1954. Charles Radcliffe, of Sowerby-bridge, York, manufacturer. A machine or apparatus for moistening or "damping" woollen or other textile fabrics for finishing.

Dated August 30, 1855.

1955. James More, of Glasgow, Lanark, rivet manufacturer. Improvements in marine and surveying-compasses.

1957. John Gedge, of Wellington-street South, Middlesex. Improvements in the manufacture of casks or barrels. A communication from Michel Lavaud, Lebourne, France.

1958. Charles Frederick Stansbury, of Gracechurch-street, London. An improved plane-iron. A communication from Henry A. Bleckmann, of Ronsdorf, Prussia.

1959. Charles Frederick Stansbury, of Gracechurch-street, London. An improved changeable lock. A communication from Henry A. Bleckmann, of Ronsdorf, Prussia.

1960. Charles Frederick Stansbury, of Gracechurch-street, London. A machine for splitting leather, and for analogous purposes. A communication from M. H. Merrian and Joseph B. Crosby, of Massachusetts, United States.

1961. John Juckes, of Baker-street, Lloyd-square, Islington. Improvements in furnaces.

1962. Henry Constantine Jennings, of Great Tower-street, practical chemist. An improved compound or medicine for cholera and diarrhœa.

1964. Paul Eugène Charton, watchmaker, of Troyes, French empire. An improved metallic manometer.

Dated August 31, 1855.

1965. William Russell Palmer, of New York, United States. Improvements in writing-desks, which can be used in the dark, or after a person has retired for the night, or by the blind, or those with weak eyesight.

1966. Rudolph Schramm, of Warwick-crescent, Harrow-road, Paddington, Middlesex. A new process for treating cotton-seed for the purpose of, and previous to the obtaining of oil from it. A communication.

1967. John Gedge, of Wellington-street South, Middlesex. Improvements in kilns, ovens, or furnaces. A communication from Pierre Michel Roy and Edine Joseph Desmergee, of St. Veram, France.

1968. George Frederick Rose, engraver and printer, of Ann street, Birmingham, Warwick. Certain improvements in lithographic and copper-plate printing-presses.

1970. James White, of East-street, Middlesex, engineer. Improved machinery for cutting soap into slabs, bars, and cakes. A communication.

Dated September 1, 1855.

1972. Robert Walter Winfield, of Birmingham, Warwick, merchant and manufacturer, and John Jackson, of Birmingham, press tool-maker. Improvements in metallic bedsteads and other articles of metallic furniture.

1976. Alexander Isaac Austen, of Belmont, Vauxhall, engineer. An improvement in the manufacture of candles and night-lights.

1978. Thomas Bentley, of Margate, Kent, ironmonger. Improvements in apparatus for heating water or other fluids by gas.

Dated September 3, 1855.

1984. Thomas Joseph Larmuth, of Salford, Lancaster, machinist, and John Smith, of the same place, machinist. Improvements in machinery or apparatus for printing.

1986. Edward Greene Jones, of Smethwick, Staffordshire, artist. An improvement in flattening cylinders of sheet glass.

1988. William Henry Zahn, of New York. Improvements in machinery for making covered or plated twist and cord.

1990. Henry Edward Flynn, of Retreat, Ranelagh, Dublin, gentleman. Making signal communications between the guards and drivers of railway-trains in transitu, and also in cases of accidents, making cautionary signals to trains approaching either from before or behind.

1992. William Armand Gilbee, of South-street, London, gentleman. Improvements in the production of carburetted hydrogen gas. A communication from M. Salmon, of Paris.

1994. George Hearnden Golding, of Maidstone, Kent, engineer, and Thomas Paine, of Blackheath, in the same county, bootmaker. Improvements in the manufacture of boots, shoes, clogs, and other like coverings for the feet.

Dated September 4, 1855.

1996. William Woodcock and Thomas Blackburn, of Over Darwen, Lancaster, and James Smalley, of Blackburn, same county. Improvements in the pistons of steam-engines, which improvements are also applicable to pump-buckets.

1998. William Henry James, of Camberwell, Surrey, civil engineer. Improvements in steam-engines.

2000. David George Foster, of Pentonville, Middlesex. Improved means of supporting or training plants.

2002. Warren Delarue, of Bunhill-row, Middlesex. Improvements in treating Burmese naphtha when obtaining products therefrom.

2004. Augustin Morel, of Roulaix, France, wool-comber. Certain improvements in machinery for preparing fibrous materials to be combed or spun.

2006. James Henry Bull, of West-Farms, New York, United States. Improvements in fountain inkstands.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September* 18*th*, 1855.)

1019. John Henry Johnson. Improvements in hair and other pins used as dress or ornament astenings. A communication from Eugene Bourdon, of Paris, France, mechanical engineer.

1027. Thomas Taylor Lingard. Certain improvements in presses, which improvements are also applicable to raising heavy bodies.

1029. John Henry Johnson. Improvements in machinery or apparatus for the manufacture of paper tubes to be employed in connection with spinning-machinery. A communication from Jacques Motsch, of Cernay, France, lithographer.

1030. John Allin Williams. Improvements in machinery or apparatus for driving or actuating ploughs and other implements employed in working and cultivating land.

1032. Benjamin Hallewell. Improvements in drying grain which has not been subjected to the process of malting.

1034. Jules Joseph Imbs. Certain improvements in manufacturing cartridges or cases for containing charges for fire-arms. A communication.

1043. Richard Shiers Markindale. An improved method of removing wool from sheepskins and other peltry.

1053. Alfred Vincent Newton. An improved mode of preparing colours for printing and staining fabrics. A communication.

1071. John Herdman. Improvements in the manufacture of wrought-iron plates adapted for ship-building and other purposes for which strength and lightness are required.

1076. Peter Armand Lecomte de Fontainemoreau. Improvements in machinery for boring or perforating stone and other materials. A communication.

1112. Wharton Rye. An improved railway-wheel, which may also be employed for other similar purposes.

1114. Alexandre Maximilien Mennet. Certain improvements in ornamenting textile and other fabrics.

1145. William MacNaught. Certain improvements in steam-boilers or generators.

1146. John Mahon Murton. Improvements in sister-hooks and thimbles for ships' and boats' riggings, such improvements or parts thereof being applicable also to other purposes where hooks are required.

1167. James Atkinson Longridge. Improvements in the construction or the manufacture of guns and artillery, and of other vessels intended to resist great pressure.

1181. Edwin Hassler. An improvement or improvements in frames for pictures, drawings, engravings, and other similar articles.

1187. Henry Henson Henson. An improvement in the manufacture of fabrics suitable for goods-wrappers and other purposes for which canvas has been or may be employed.

1320. Masta Joscelin Cooke. Preserving provisions and vegetables, suitable for armies in the field, for vessels on long voyages, and other purposes, and also for the necessary apparatus for preserving and preparing the same for food.

1351. Henry Henson Henson. Improvements in the construction of portable and other buildings, and in the means of ventilating buildings.

1622. Vincent Scully and Bennett Johns Heywood. Improvements in the construction of cocks and taps.

1623. Vincent Scully and Bennett Johns Heywood. Improvements in the construction of locks and latches, and in keys for the same.

1690. Vincent Scully and Bennett Johns Heywood. Improvements in vessels for containing and preserving fluids.

1786. James Alexander Manning. Improvements in the treatment of sewerage.

1812. George Durham and Cornelius Wyatt. Improvements in the manufacture of grease for lubricating the axles of railway and other carriages, and the journals of machinery generally.

1839. Thomas Kempson. A new or improved steam-engine and boiler.

1870. David Brown and Jeremiah Brown. New or improved machinery for the manufacture of bayonets.

1871. George Collier. Improvements in weaving plush by power, parts of which improvements are applicable when weaving other fabrics.

1879. Alphonse René Le Mire de Normandy. Certain improvements in the manufacture of soap.

1881. Alexander Bain. An instrument or apparatus for distributing liquids.

1904. Thomas Eyre Wysche. Improvements in propelling vessels.

1918. Thomas Delarue. An improvement in printing-inks.

1936. Charles Humfrey the younger. Improvements in the manufacture of fatty and oily acids.

1942. Charles Humfrey the younger. The application of certain products of fatty and oily matters to the manufacture of candles and other uses.

1944. Alfred Vincent Newton. Improvements in separating substances of different specific gravities. A communication.

1946. Benjamin Moore. Improvements in sewing machines. A communication.

1955. James More. Improvements in marine and surveying compasses.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed September 12, 1855.

558. Auguste Edouard Loradoux Bellford.

Sealed September 14, 1855.

576. Julian Bernard.

579. Abraham Davis.

580. John Hetherington and Archibald Vickers.

583. Nathan Robinson, John Lister, and Henry Stevenson.
634. James Biden.
723. William Henry Balmain.
935. François Joseph Anger.
1087. James Buchanan.
1104. Edward Pellew Plenty and William Pain.
1190. Robert William Waithman and Joseph Waithman.
1219. John Whitehead, jun., and Robert Kay Whitehead.
1475. Simon Davey.
1535. Alfred Vincent Newton.

Sealed August 18, 1855.

613. Philippe Roehrig.
614. Louis Henry Crudner and Frederic Louis Koebrig.
615. John Smalley.
621. William Taylor.
622. Thomas Mara Fell and Francis Squire.
624. Charles Marsden.
628. Auguste Edouard Loradoux Bellford.
631. William Miller.
654. Griffith George Lewis and Joseph Gurney.
686. William Dray.
701. Alexander Dalgety.
702. John Henry Johnson.
705. Anatole Bère.
715. Theophilus Wood Bunning.
716. Theophilus Wood Bunning.
750. Maximilien Evrard.
786. Peter Armand Lecomte de Fontainemoreau.
853. John Kay.
886. Richard Bright.
970. Pierre Dèpierre.
983. Thomas Lambert.
989. William Basford.
1148. John Henry Johnson.
1312. Isaie Lippmann.
1377. John Sellars.
1503. William Clay.
1561. Edwin Daniel Chattaway.
1597. William Edward Newton.
1599. William Pidding.
1600. William Pidding.
1601. Scipion Salaville.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; *W. C. Campbell and Co.*, Hamburg.

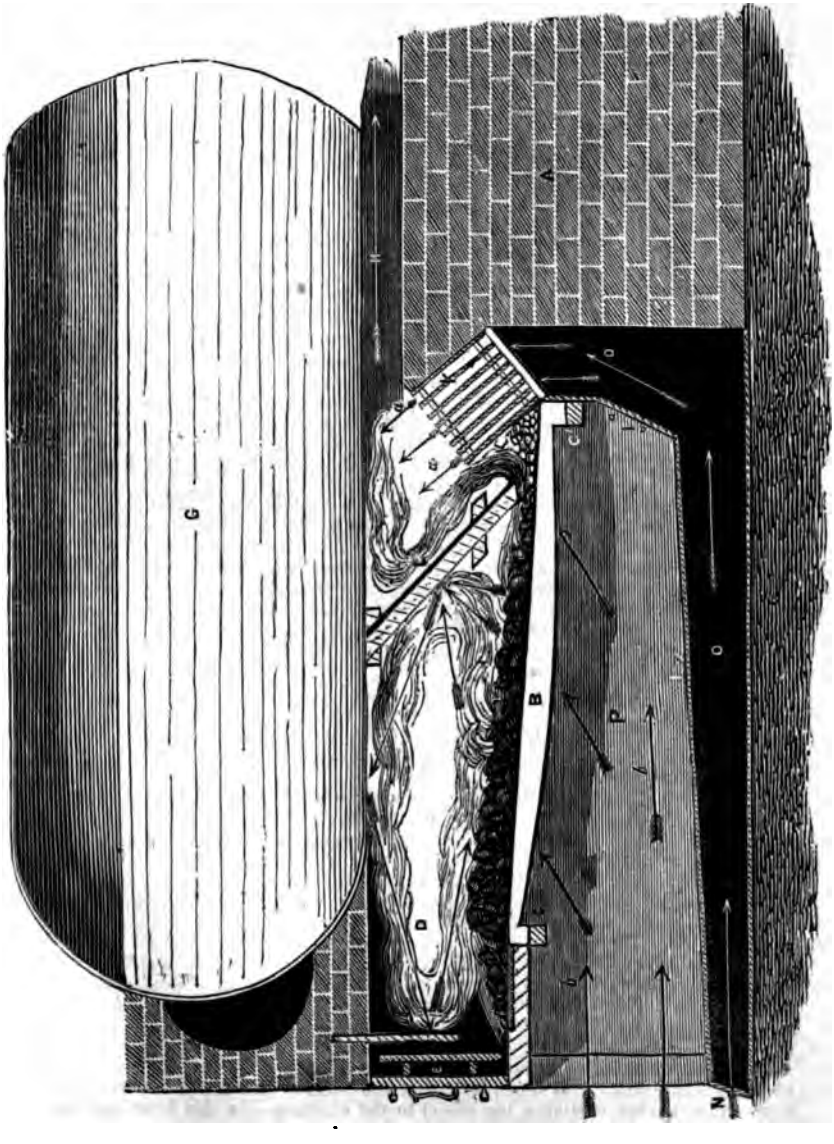
[redacted]

Mechanics' Magazine.

No. 1677.] SATURDAY, SEPTEMBER 29, 1855. [Price 3d

Edited by R. A. Brooman, 166, Fleet-street.

GARDNER'S PATENT SMOKELESS FURNACE.



GARDNER'S PATENT SMOKELESS FURNACE.

Mr. E. V. Gardner, of Norfolk-street, London, has patented the furnace represented in the engraving on the preceding page. A is the brickwork supporting the furnace; B are the fire-bars resting upon the bearing bars, C C, in the usual manner; D is the furnace; E is the furnace-door; F, the fuel; G is the boiler; H, the flue; I I is a division of metal or other material placed in the ash-pit, extending to the bearing-bar, C′. The whole is rendered air-tight, so as to prevent the passage of air in any other than the desired direction. K K, are diaphragms or plates for heating the supply of air; they rest on supports, and have ribs or projections cast on them in order to keep them at stated distances from each other. L is a deflecting plate, inclined towards the diaphragms, K K. M is a plate hanging inside, and close to the door of the furnace. N is the valve to the air-flue, O O, which supplies air through the plates, K K, to the heated products. P is the ash-pit.

The action of the furnace is described by the inventor as follows:—"After having charged the furnace, the door, N, of the air-flue, O O, being closed, the fuel is ignited, and the furnace door, E, is closed. The heat from the ignited fuel causes the plate, L, and the plates, K K, to become heated. The door, N, of the air-pit, O O, is then opened sufficiently to supply an adequate quantity of air through the plates, K K′, care being taken that the opening is not so great as to prevent a perfect draught through the fire-bars from the ash-pit. This air becoming heated in its passage through these plates, and being directed by them towards the deflecting plate, L, as shown by the arrows, *a*, meets with the heated products of the burning fuel which are passing under the plate, L, combines with them and causes their perfect combustion, the resulting highly heated and invisible products passing off by the flue, H, to the shaft, as in ordinary circumstances. The products given off from the heated fuel, in the furnace, D, urged by the draught of air from the ash-pit indicated by the arrows, *b*, *b*, are brought in contact with the heated deflecting plate, L, and are thereby deflected, according to the angle at which they meet the plate. Some portions are deflected into the draught immediately beneath the plate, L, and are thus carried upwards behind it and above the plates, K K, where combustion takes place, as described. Other portions are deflected from the upper surface of the plate to the roof of the furnace, thence again to the plate, M, whereby they are again deflected down upon the heated fuel, and in a highly heated state are carried by the direct draught beneath the plate, L, and are consumed, as before described."

In introducing his invention to the public, Mr. Gardner says, "This process not only consumes the black carbonaceous particles usually termed *Smoke*, but also that which has been termed by recent inventors *White Vapour*, so that all that large portion of the coal, which otherwise would escape by the chimney, is here applied to the production of heat. It has been found by careful experiments, conducted over a long period, that a saving of from 30 to 40 per cent. is realized by the adaptation of these improvements.

"It is a well-known fact, *that if cold air be admitted into the furnace*, as is too frequently the case, it not only cools down the temperature of the burning materials, but is also of itself incapable of effecting perfect combustion, the consequence of which is a partial consumption only of the products given off from heated fuel, the remainder escaping as smoke or white vapour. On the other hand, *air passing through a hot fire becomes decomposed*, and unfit to form that chemical combination with the heated particles which is necessary for combustion. Moreover, when these two elements are not brought together in the proper proportions, the combustion will be imperfect.

"But by this invention all these defects are avoided. Not only is a proper supply of air obtained, in a state of intense heat and purity, for the combustion of the gases from the green coals, but, by means of the diaphragms, the constant air supply is kept at a sufficient heat throughout the whole period of combustion, and ensures the perfect oxidation of the remaining carbon, preventing its escape as carbonic oxide. The smoke and inflammable products are also presented to this hot-air supply in a state of incandescence, whereby immediate and perfect chemical combustion are produced, and the largest amount of effective heat given out. There is as much importance as regards economy of heat in burning the invisible carbonic oxide always formed during imperfect combustion of fuel as in consuming the visible carbon. When properly effected, an enormous saving of fuel results. This is perfectly accomplished by means of this invention. The air supply being split up by the diaphragms into very fine currents, prevents any injury to the front draught of the furnace, while at the same time the splitting-up process gives a most essential increase of surface and presents the air in numerous currents or jets to the gaseous products, thoroughly surrounds and intermixes with them, instead of escaping, as they otherwise would do, in two *strata or* layers (one overlying the other) to the chimney. In this latter case, imperfect *combustion must result*, as that process could only occur at the point of contact."

PARIS UNIVERSAL EXHIBITION.

DEPUTATION FROM THE SOCIETY OF ARTS TO THE EMPEROR NAPOLEON III.

On Sunday last the Emperor gave an audience at St. Cloud to a deputation from the Society for the Encouragement of Arts, Manufactures, and Commerce, consisting of the Chairman of Council, Dr. Booth, and the following members:—Mr. Cole, C.B., Dr. Royle, Mr. Chadwick, C.B.; Mr. Chance, of Birmingham; Mr. F. Chance, Mr. Lucy, Lord Ebrington, Sir Charles Fox, Mr. Francis Bennoch, Mr. Palmer, Mr. Simpson, Mr. Hollins, and Mr. Le Neve Foster, the secretary. His Majesty was prevented by the news from the seat of war, and the important demands on his time connected therewith, from receiving the deputation when Mr. Edward Baines and other representatives of the local institutions associated with the Society were in Paris. The Society's visit here had terminated, and the Chairman and officers had returned to London in considerable disappointment at not having had an opportunity of presenting the address which they had prepared for the occasion, when an intimation reached them that the Emperor would receive them to-day. This will account for the smallness of the deputation as compared with what was originally intended. Lord Cowley was in attendance, and introduced the members, whereupon Dr. Booth presented to His Majesty the following address:

"May it please your Imperial Majesty,—We, the Council and Members of the Society instituted at London, in 1754, for the Encouragement of Arts, Manufactures, and Commerce, together with the representatives of the literary, scientific, and mechanics' institutions throughout Great Britain and Ireland associated with us, beg leave to approach your Imperial Majesty with sentiments of the most profound respect.

"In accordance with the recommendations of his Royal Highness the Prince Albert, our illustrious President, who founded the Exhibition of 1851, in whose success our Society took a deep interest, we have visited this magnificent city to judge for ourselves of the effects of such displays of industry in accelerating the progress of arts, manufactures, and commerce, as also carefully to inspect those splendid public works which adorn the capital of France, and reflect a lustre on your Majesty's name that will be as lasting as themselves.

"Since our arrival we have regarded with feelings of admiration and delight the manifold features of this Great Exhibition. We rejoice to be enabled to express our decided opinion that the contents of its several compartments afford the most convincing evidence of the marked and rapid progress which has taken place in arts and manufactures during the last four years.

"The sublime conception of inviting all nations to contend in friendly rivalry with each other for the promotion of the material welfare of mankind is fully developed and once more realized in the French Universal Exhibition. This grand display of the vast and varied results of genius and industry assures us that the waste of war will be in some measure compensated, and that beneath the peaceful banners of an onward civilization the nations of the west will achieve victories not less glorious than those which, under Providence, the justice of their cause and their own enduring bravery have won for their united arms. While the impulse thus given to the cultivation of the arts of peace has multiplied the relations and strengthened the bond of union between France and England, their political alliance, consecrated by the blood of the bravest and noblest of their sons, has ripened into the cordial sympathy of national friendship. That blood has not been shed in vain, for we hold it as our deepest conviction that the solidarity of France and England is the one sure guarantee for the conservation and advancement of the civilization of the world. And we further believe that they may best promote their mutual prosperity by a freer interchange of the products of industry, and consolidate their alliance by uniting their exertions to give a wider development to arts, manufactures, and commerce, whose progress it is the special object of our society to advance.

"As the faithful and unswerving upholder of that alliance, and the conservator of civilization, your Majesty receives from us and from our fellow-countrymen of every class and grade the spontaneous homage of an unquestioning confidence. We pray your Imperial Majesty graciously to accept this our humble tribute of profound respect and unfeigned admiration.

"Given under our common seal this 8th day of September,

"James Booth, Chairman of the Council.

"P. Le Neve Foster, Secretary."

The Emperor made a gracious reply, thanking the society and the distinguished individuals present for their address, and expressing his sense of the great kindness which he had received from the English people generally. He then, according to the *Times'* correspondent, entered into conversation with several of the members, especially singling out Mr. Chadwick, whose opinion he asked as to how he found Paris.

"Very fair above, and very foul beneath," replied the ex-official sanitary reformer, and he proceeded to tell His Majesty that as it was the boast of Augustus' that he found Rome brick, and left it marble, so it was practicable to effect changes here which would enable His Majesty to say that he "found Paris stinking, and that he left it sweet." The Emperor seemed a good deal tickled by these home truths, and, indeed, generally by what Mr. Chadwick stated about the sewage of the French metropolis, the high houses of which he compared to so many perpendicular streets. The reception lasted for half an hour.

DUNDAS'S MALLEABLE IRON ORDNANCE.

In our number for June 16 (No. 1662, p. 563), we made mention of a wrought-iron gun, manufactured by Mr. Dundas, at Paragon Works, North Britain, on a principle maintained by him to be the only practicable method by which guns and mortars of that material, and of large calibre, could be made sound and trustworthy; the difficulty of procuring dense and solid forgings of great bulk being well known to every practical engineer. This gun, a 9-pounder, was sent down to Woolwich to be proved. Two heavy charges of 9 lbs. of powder and a ball, the usual proof charge of a cannon of this size, were first fired from it. These produced no change in the gun nor displacement of its parts. Fifty rounds of ordinary service ammunition were then rapidly fired from the cannon, causing no change whatever. The gun was then sent down to Shoeburyness for a further and more severe ordeal. This it underwent some days ago, and as 36 ordinary service rounds more were fired from it without any remarkable result, the charge was gradually increased to four, five, and lastly to six pounds of powder and two balls. Under this powerful application the gun at length began to yield, and it finally became unserviceable at the third round of the last series; six pounds of powder, two balls, and a wad. In all 152 rounds were fired from it.

The method of the construction of this gun is as follows:—Four bars of iron, about an inch thick, five inches broad, and the proper length of the gun, are put up longitudinally into segments of a circle, which if placed edge to edge form the rough outline of the bore. The edges of these bars are then accurately planed. The bars or staves are now hooped temporarily as a cylinder by means of two rings at the extremities, and turned in a lathe to a surface perfectly true and cylindrical. A series of iron rings, three inches broad and three-quarters of an inch thick, carefully welded, are bored to a size slightly smaller than the barrel or cylinder; these, being afterwards expanded by heat, are one by one placed on the cylinder and plunged into cold water. Instant contraction ensuing, the staves are compressed more powerfully than could be done by any artificial means, and no appearance of a joint in the staves is perceptible. The exterior surface of the mass is again turned perfectly cylindrical, and a second series of rings placed in like manner over the first "breaking band." This time in the lathe the iron assumes the exterior of a cannon, the trunnions having been previously placed or forged on a centre ring. To bore the gun with great perfection is very simple, as the boring bar can be supported at both ends, and the breech end of the gun being, for a few inches, bored slightly conically with a shoulder, into which fits a solid plug introduced from the muzzle. The cannon is now complete. Of course the best workmanship and fittings in the manufacture of such a gun are indispensable, and without the large planing machines, lathes, and other powerful tools now in use, which, while they save manual labour, do their work with unerring accuracy, such a piece of ordnance on a large scale could not be constructed. Since this gun was made many improvements have suggested themselves to the inventor, who was much in doubt as to the proper proportions required by the separate parts of the cannon, and who, perhaps too confidently, made his gun much slighter than service ordnance of the same calibre, this being one-third lighter than a cast-iron 9-pounder gun. By the substitution, also, of tilted cast steel for iron staves a double strength will be secured, while, by corrugating the cylinder to the extent of from one-eighth to one-sixteenth of an inch, and turning the rings to fit these corrugations when shrunk on, great additional tenacity will be gained. Adopting these alterations, Mr. Dundas is now engaged in the manufacture of another gun, which he is confident will resist every fair means that may be used with the view of destroying it.

By thus making cannon in pieces comparatively small, no difficulty exists in obtaining perfect soundness and solidity in each separate part, and insuring equal trustworthiness in the whole. This cannot be secured in large masses of iron, from the constant heating rendering the interior raw and crude—an evil aggravated each time the mass is put into the furnace and withdrawn, when the surface only is exposed to the action of the hammer, which, even though that instrument be a ponderous engine weighing six tons, fails to compress the vast incandescent bulk on which it descends.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The twenty-fifth meeting of this Association, recently held at Glasgow, having been concluded, it falls to us to bring before our readers such of the papers submitted to it as claim their attention. These we shall introduce into our pages as we find convenient, as independent articles, affixing to each, as a foot-note, the words "British Association, 1855."

We shall not occupy space by detailing the general arrangements of the Glasgow meeting, as those embrace much which, while it is of the highest interest to those concerned in one or more of the various branches of science, is nevertheless remote from our objects. One of the most important of those features of it which belong to our department of science, was a speech by Mr. W. J. Macqnorn Rankine, C.E., F.R.SS. L. & E., on the nature and objects of the section G—Mechanical Science—over which he presided. The following is a report of this speech:

Although this section bears the title of "Mechanical Science," it is well understood that questions of *pure* or *abstract mechanics* form no part of its subjects.

The object of this section is to promote the *advancement of science as applied to practice in the mechanical arts.*

The special utility of this section arises from the fact, that the application of scientific principles to practice is a study of itself, distinct alike from pure science and from pure practice.

On the one hand, the cultivation of mechanics and other branches of natural knowledge, in a manner purely scientific, has for its object, first, to improve the mind of the cultivator intellectually and morally; and secondly, to qualify him, if possible, for assisting in the advancement and diffusion of knowledge; and with this view each subject requires to be treated so as to investigate how the laws of particular phenomena are connected with the general economy of nature and the structure of the universe.

On the other hand, the cultivation of *purely practical knowledge*, such as is acquired by experience in business connected with the mechanical arts, has for its object to enable the cultivator to judge of materials and workmanship, and of questions of convenience and of commercial profit, to manage and direct the execution of work, to imitate existing structures and machines which have proved successful, and to follow rules the utility of which has been established by practice.

The gap between those two kinds of knowledge is so wide, their methods and objects are so different, that rare as it is to find individuals who have cultivated both, and profited by each independently, it is still more rare to find those who are able to combine their advantages; and hence seems to have arisen the prejudice, once deeply rooted and widely spread, but now happily fast disappearing—that theoretical and practical knowledge are mutually inconsistent and exclusive.

In fact, the study of scientific principles with a view to their practical application is a distinct art, requiring methods of its own.

This third and intermediate kind of knowledge, is that for the advancement of which this section of the British Association was established.

It enables its possessor to plan a structure or machine for a given purpose without the necessity of copying some existing example—to compute the theoretical limit of the strength and stability of a structure, or the efficiency of a machine of a particular kind—to ascertain how far an actual structure or machine fails to attain that limit, and to discover the cause and the remedy of such shortcoming—to determine to what extent, in laying down principles for practical use, it is advantageous, for the sake of simplicity, to deviate from the exactness required by pure science; and to judge how far an existing practical rule is founded on reason, how far on mere custom, and how far on error.

Of those advantages, the more eminent of the designers and constructors of great works of mechanical art are well aware, and have extensively availed themselves; but much still remains to be done towards impressing the general public with a due sense of the mutual dependence and harmony between sound theory and good practice; and towards the attainment of this object, it cannot be doubted that the proceedings of this section of the British Association have been and will be of important service.

Another benefit towards which the proceedings of this section are conducive, arises from the fact, that in many cases the best, and in some cases the only means of impressing on the public mind the truth and the importance of scientific principles, consists in their practical application, which thus re-acts beneficially on the diffusion and the appreciation of theoretic knowledge.

There is also a beneficial reaction of practice upon theory of a different, but not a less important kind; and that is, when the progress of the mechanical arts either suggests problems for scientific investigation, or affords data for their solution, or leads to the improvement of the instruments of scientific experiment.

Fifteen years since, there was established

by the crown, in the University of Glasgow, a chair of mechanics, whose history well illustrates the prejudices which formerly prevailed on the subject of the connection between theory and practice, and the extent to which those prejudices are disappearing. That chair was not established for the teaching of purely theoretical knowledge, which had been already well provided for by the older chairs of the university. It was not for the teaching of purely practical knowledge, which can be acquired by experience in business alone. An impression seems to have at first prevailed that the chair was of no use; and, in consequence, the attendance (notwithstanding the great ability and energy of the professor, Mr. Gordon) was at the outset so small, that he was latterly induced for some seasons to discontinue his lectures. But taking into consideration the progress which a due appreciation of the advantages of practically applied science had made of late years, Mr. Gordon resumed his lectures last winter, and obtained at once a numerous attendance of students, who showed, without exception, an earnest zeal to profit by his instructions. That chair bears the same relation to the chair of natural philosophy which section G of the British Association bears to section A.

These general statements of the advantages of that kind of knowledge which it is the business of this section to advance, will, I trust, be amply illustrated by the proceedings of the present meeting; for I am happy to be able to state, that the papers which will be laid before us are numerous and interesting, and, in short, such as might be expected at a place of meeting whose neighbourhood is well known to abound in striking instances of the successful application of mechanical science to practice.

For the discussion of that subject a more appropriate scene could not be found than this university, whose walls afforded shelter, and whose inmates, invaluable friendship, to the early days of obscurity and toil of him who afterwards showed to the world the brightest example of that combination of practice and science which it is our aim to promote—James Watt.

The president concluded by referring to the position of inventors and the operation of the patent laws, as subjects well suited for the consideration of the section, and in a paper read on a subsequent evening, while acknowledging the benefits derived from the amended patent law, he pointed out the following defects in its operation as subjects for discussion in the section:—1. The granting of patents for useless inventions. 2. The granting of more than one patent for the same invention during the currency of the provisional protection of the first. 3. The granting of patents for foreign inventions to persons other than the inventor or his assignee. How far these evils were to be removed by improvements in the administration of the law, and how far by amendments in the law itself, were subjects left for further consideration.

ON THE OPTICAL ILLUSIONS OF THE ATMOSPHERIC LENS,

AND ITS EFFECTS ON CELESTIAL BODIES.

BY EVAN HOPKINS, C.E., F.G.S.*

It is acknowledged by astronomers that the laws of atmospheric refraction are still in a very unsatisfactory state; and that this uncertainty affects and vitiates some of the most important data of astronomy.

Our globe being completely enveloped in this atmospheric media, which possesses the ordinary properties of a lens, that is in refracting, reflecting and augmenting all objects viewed through it obliquely, it becomes necessary to know something of its general character before we commence any important astronomical observations.

During many years spent near the equator, I found it necessary to prepare a table of refractions, founded on direct observations in that region, from the horizon to the zenith, so as to determine the exact amount of refraction at different elevations.

The period selected for this purpose was when the sun passed the zenith, and when the rising and setting was at 6 a.m. and p.m., making a complete semicircle above the visible horizon in 12 hours.

As the sun describes its apparent daily path in 24 hours, it follows as a necessary consequence that its real position at 6 in the morning and 6 in the evening, must be in a line drawn through the centre of the earth.

But the refractive powers of the surrounding atmosphere cause the sun to appear in two horizons, *diametrically opposite at the same instant of time*, *i. e.*, one half of its diameter in one horizon, and the other half in the opposite horizon, precisely at 6; thus we find that the diameter of the atmosphere is so adjusted as to neutralize the intervening diameter of the earth altogether; hence we have a complete semi-circle of the sun's apparent path above every equatorial horizon.

The maximum of this refracting angle is equal to the semidiameter of the sun in the horizon, viz., 16′·30″ in the ordinary state of the atmosphere. This gradually diminishes until the sun arrives in the zenith, when the refraction is reduced to zero.

The following are the results of repeated

* British Association, 1855.

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observations in the tropics, made with several sextants and repeating circles:

The sun rising	Elevated by refraction.
∠ 0°	16′30″
15	13 40
30	11 0
45	8 10
60	5 20
75	2 40
90	0 0

I made a large sun-dial, which agreed with some of the best time-pieces during the year, indicating no variations in the *angle* of the shadow of the style.

Had the atmosphere been constantly of a uniform density, the law of sines for the optical refraction would diminish in a geometrical ratio from the maximum to the zenith zero; but the density is much greater and much more susceptible of changes near the horizon than at a higher elevation. This, together with the very oblique or concentric position of the atmospheric strata, renders it very difficult to determine the actual amount of the refraction at all times near the horizon.

In the equator from the level of the sea to about 1,000 feet high, the diurnal oscillations of the barometer are extremely regular, and, comparatively, very small; the maximum at 11 A.M., and the minimum at 5 P.M.

The above amount of refraction must be considered as confined to the equatorial zone, and not to regions where the atmosphere is subject to great and sudden changes.

The atmospheric lens not only refracts the rays when not in the direction of the radius—that is, in the zenith—but also *augments* the size of celestial bodies, such as the sun, the maximum diameter being in the horizon, and the minimum in the zenith.

According to a series of observations made by me for upwards of ten years within the tropics, with some of the very best instruments, the sun's *apparent* diameter throughout the year is *the same* when measured in the zenith; its observed variable diameter is a mere optical allusion, and not owing to variable distances from our globe, as founded by Kepler. The following measurements exhibit the apparent variation of the sun's diameter in the plane of the orbit during its daily apparent path from the rising to the setting, as carefully observed near the equator.

The sun rising	∠ 0°	32′ 55″	in the horizon.
	15	32 35	
	30	32 18	
	45	31 55	
	60	31 32	
	75	31 6	
Noon	90°	30′ 36′	in the zenith.
	75	31 2	
	60	31 30	
	45	31 50	
	30	32 15	
	15	32 32	
Setting	0	32 54	in the horizon.

The same optical illusion is also observed in the meridian. In taking observations from the equator north and south, we find the sun's diameter when in the meridian in

The tropic of Capricorn	31′ 20″	
Equator	30 36	in the zenith.
Tropic of Cancer	31 20	

In New Granada, North latitude 5° 10′, I found the sun's diameter, by means of numerous observations carried on during many years, as follows:

	Altitude.	Diameter.
South tropic	∠ 61° 22′ 37″	31′ 30″
Equator	84 50 0	30 45
Zenith	90 0 0	30 36
North tropic	71 35 20	31 12

In England the observed diameters of the sun in the meridian, according to the Nautical Almanack, from its greatest elevation in June, to its lowest declination in December, is as follows:

	Altitude.	Diameter.
June	∠ 61° 58′ 53″	31′ 30″ 18
September	38 31 22	31 58 12
December	15 3 51	32 36 4

All these variable diameters correspond to the angles of elevation.

In latitude 40° south, on the 2nd of June, 1852, I drew the attention of Captain Smith of the *Futtel Oheb* to this subject, and requested him to take direct observations to prove the correctness of the statements in my work on Geology and Magnetism. The "Nautical Almanack" indicated a diameter of 31′ 34″ for that day. The meridian altitude of the sun was about 22°, and its actual apparent diameter was found to be 32′ 22″ according to the mean of all the instruments on board, thus making a difference of 48″ between the "Nautical Almanack" and the direct observations.

The Captain became so convinced of the fact, that he resolved in futnre to be guided by the angular position of the sun to ascertain its diameter to find out the longitude, and more especially when sailing in the southern hemisphere.

Subsequently I had the opportunity of making a series of observations in Melbourne in latitude 38° S. The following are the results:

In December the sun at its greatest meridional altitude ∠ 75° 27′ 3″, 31′ 0″ diameter.

Mar. & Sept.	52 0 0,	31 40	„
June	28 32 29,	32 20	„

Had Kepler been aware of these laws of atmospheric refraction—the augmentation of celestial bodies when they are looked at obliquely, &c., he would not have made the annual orbit an ellipse. Had astronomers existed at that period in the Antipodes, they would have informed those in Europe that the apparent variable diameters of the sun were quite the reverse in the south to what they appear to be in the north. Therefore we must have some other reasons than merely the observed variable diameter of the sun to maintain that the orbit of the earth is an ellipse. The apparent variable velocity is also produced by the same atmospheric illusion; hence the origin of the erroneous supposition that the southern hemisphere is less favoured by the sun to the amount of 7 days 16 hours and 50 minutes than the North.

It is time that such errors should be corrected.

ARTILLERY AND PROJECTILES.

A paper written by Mr. W. B. Adams, on the above subject, and read by Mr. Ward at the British Association Meeting (Section G, Mechanical Science), gave rise to a very important discussion in which Mr. Fairbairn, Dr. Robinson, and others took part. The paper gave a description of various kinds of projectiles, and the philosophical reasons why gun-cotton is better for blasting rocks than for gunnery. The first guns in use in all countries were long; but the inconvenience of very long guns was the cause why the length was curtailed, and why also carronades and mortars were invented. The paper then went on to describe the material of which artillery should be made, and the proper mode of manufacture, and an improved trunnion, with some original suggestions regarding the form of wadding and shot best suited to give sure aim and increased velocity and penetration. In giving his idea of the best form of a ball, Mr. Adams thought that the conical form, with feathers, was the best, which is exactly that which Mr. Kennedy, of Kilmarnock, has lately patented, and which has been experimented upon lately at Ardrossan and Troon. The idea of an elongated ball, which should also be charged like a bomb, has also been anticipated by Mr. Kennedy. Welded guns, united by hydrostatic pressure—the coating inside with another metal to prevent abrasion — and several other improvements, which have in part been adopted by inventors, were also recommended.

Dr. Robinson was of opinion that feathers upon a ball was a mistaken idea, because the ball carries with it a portion of air, and that rotation could not be secured to the ball by feathers alone, as they could not act but on the body of air which they carried with them. Rifled guns are more liable to burst, because the force necessary to explode a ball from such a piece of ordnance is much greater than that required for a plain bored gun; and also that a rifled gun is much more liable to burst or be rendered useless from frequent discharges, because of the force necessary to cause rotation having to be added to that which causes projection. Dr. Robinson alluded to the bronze guns of the Dardanelles, which are of three feet bore, used against our fleets not many years since, and which were made by Mohammed II., and asked whether bronze might not now be used instead of cast-iron. He suggested the probability that on experiment railway-iron might be found better than cast-iron for ordnance.—Mr. Fairbairn said the material of which guns were made was not so good as it was fifty years ago. He was present at Woolwich this week, and saw the practice of the guns there. One of them seemed properly moulded in every part; but it was found that the welding in one part was not sound and the gas getting into the fracture operated just like a wedge, and split it as if it had been made of paper. Another was formed of steel bars, with a breech of cast-iron attached to it. The breech was entirely blown off the gun, and the bars torn asunder. It appeared to him absolutely necessary to have such a material as would not only resist the severe impulse which the discharge of the shot caused, but be perfectly solid in the mass. If they were made of parts, such as the staves of a cask, these opened, and the result was the fracture of the gun. The Stirling gun was a mixture of wrought with cast-iron, and it certainly carried one-fourth or one-fifth more of common pressure, but when applied to artillery under Colonel Dundas, after a few rounds the pieces were burst. The mode of casting these large guns is also defective. They were generally cast solid, and in the cooling the metal was left exceedingly porous in the centre, and when one began to bore out the gun, one found it was not of so close a texture inside as out. Now they took the precaution of having cores in the middle, through which they sent a current of cold water to cool the inside simultaneously.—Dr. Robinson: About a century ago they cast them hollow, and it was thought a great improvement to cast them solid.—Mr. Fairbairn believed if they went about the work more carefully, they would arrive at a safer and better mode of casting than at present. If the mortars were made a foot longer, he believed, instead of sixty pounds, fifty pounds of powder would carry a shell of the same weight, and to a greater

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distance, and with greater accuracy. He thought, in the mortars, a great quantity of the metal was in the wrong place in a great many cases. They had the same thickness of metal at the mouth as at the breech, whereas it might taper without any danger, the pressure being less at the mouth. He explained an ingenious ball, in which there was a spiral tube, so that the ball with an ordinary gun suited all the purposes of a rifle;* but he did not know whether the experiment was successful or not. Till lately guns of the ordinary calibre would stand 600 or 700 rounds before they were injured, but they always gave way at the vent. But they got into a plan of putting a tube into the vent, which made them stand 600 or 700 rounds more. Now-a-days the same guns would not stand 100 rounds; perhaps the reason was that the metal was not properly selected. He believed the subject was now before the authorities at Woolwich of what caused the explosion at Sweaborg, and he hoped it would lead to better material, or a better selection. The iron procured by hot blast is excellent for machinery purposes; but he did not think it the best for artillery. With regard to the Turkish artillery, he was at Constantinople some years ago, and they are almost all made of a mixture of brass and tin. Mr. Mare, at Blackwall, is now constructing a gun three feet in diameter—the breech of cast-iron and the tube of direction of wrought-iron. Whether it would answer or not he did not know.—Dr. Robinson: The bronze guns failed in a very remarkable manner. The ball rises on firing, is deflected on the gun, and if the gun is long it is again deflected, and deep holes are made in the barrel owing to the softness of the metal. Could not a thin lining of steel or wrought-iron be inserted into the tube?—Mr. Fairbairn thought it was very difficult to form any gun that differed in its parts. He would prefer to have a gun perfectly solid—of steel, if they pleased; for he had seen excellent specimens of steel manufactures from Prussia in the Great Exhibition, and well calculated for making field artillery. The artillery of the present time was much larger than it was in former times, and allowance must be made for that. The Government was endeavouring at present to get charcoal-iron from Nova Scotia, and there were large supplies of wood and iron in the Bay of Fundy.—Mr. Lawrie proposed to have no vent at all, but to fire in the manner in which rocks are blasted, by means of galvanism. This would prevent wearing at the vent. He hoped artillery would be brought to perfection, for as weapons had improved war had decreased in brutality; and he hoped there would be a good stand-up fight for it, in order that they might have a lasting peace.—A Member stated that some hydrostatic presses had been made of cast iron with a case of wrought-iron, at Mr. Downie's works here, and had stood an immense pressure, but they had not as yet tried it on guns.—Mr. Fairbairn asked if the gun made at Mr. Downie's had been cast in such a way as to cause an amalgamation of the cast and wrought-iron? If that were the case, he had no doubt it would secure great strength. He had a doubt, however, that there was a difference of ductility which would cause separation. It had occurred to him that they might be cast under extreme hydrostatic pressure. They had cast them at Woolwich with 19 feet of iron on the gun, but he did not as yet know the result.—Mr. Sykes Ward thought a gun could not explode so readily if the powder did not impinge directly on the ball.

SUBMARINE TELEGRAPH WIRES.

PERISTALTIC INDUCTION OF ELECTRIC CURRENTS.

BY PROFESSOR THOMSON.*

Recent examinations of the propagation of electricity through wires in subaqueous and subterranean telegraphic cables, have led to the observation of phenomena of induced electric currents, which are essentially different from the phenomena discovered by Faraday many years ago) of what has hitherto been called electro-dynamic, or electro-magnetic induction, but which, for the future, it will be convenient to designate exclusively by the term electro-magnetic. The new phenomena present a very perfect analogy with the mutual influences of a number of elastic tubes bound together laterally throughout their lengths, and surrounded and filled with a liquid which is forced through one or more of them, while the others are left with their ends opened or closed. The hydrostatic pressure applied to force the liquid through any of the tubes will cause them to swell, and to press against the others, which will thus, by peristaltic action, compel the liquid contained in them to move in different parts of them in one direction or the other. A long solid cylinder of India-rubber, bored symmetrically in four, six, or more circular passages parallel to its length, will correspond to an ordinary telegraphic cable containing the same number of copper wires, separated from one another only by gutta percha; and the hydraulic motion will follow rigorously the same laws as the electrical conduction,

* See *Mechanics' Magazine*, for Saturday last, No. 1676, p. 267.

* British Association. 1855. *Athenæum*.

and will be expressed by identical language in mathematics, provided the lateral dimensions of the bores are so small, in comparison with their lengths, or the viscosity of the fluid so great, that the motions are not sensibly affected by inertia, and are consequently dependent altogether on hydrostatic pressure and fluid friction. Hence the author considers himself justified in calling the kind of electric action now alluded to, *peristaltic induction*, to distinguish it from the electro-magnetic kind of electro-dynamic induction. The mathematical treatment of the problem of mutual peristaltic induction is contained in the paper brought before the Section; but the author confined himself in the meeting to mentioning some of the results. Among others, he mentioned, as being of practical importance, that the experiments which have been made on the transmission of currents backwards and forwards by the different wires of a multiple cable, do not indicate correctly the degree of retardation that is to be expected when signals are to be transmitted through the same amount of wire laid out in a cable of the full length. It follows, that expectations as to the working of a submarine telegraph between Britain and America, founded on such experiments, may prove fallacious; and to avoid the chance of prodigious losses in such an undertaking, the author suggested that the working of the Varna and Balaklava wire should be examined. He remarked that a part of the theory communicated by himself to the Royal Society last May, and published in the proceedings, shows that a wire of six times the length of the Varna and Balaklava wire, if of the same lateral dimensions, would give thirty-six times the retardation, and thirty-six times the slowness of action. If the distinctness of utterance and rapidity of action practicable with the Varna and Balaklava wire are only such as to be not inconvenient, it would be necessary to have a wire of six times the diameter; or better, thirty-six wires of the same dimensions; or a larger number of still smaller wires twisted together, under a gutta percha covering, to give tolerably convenient action by a submarine cable of six times the length. The theory shows how, from careful observations on such a wire as that between Varna and Balaklava, an exact estimate of the lateral dimensions required for greater distances, or sufficient for smaller distances, may be made. Immense economy may be practised in attending to these indications of theory in all submarine cables constructed in future for short distances; and the non-failure of great undertakings can alone be *insured* by using them in a preliminary estimate.

OBTAINING LITHOGRAPHS BY THE PHOTOGRAPHIC PROCESS.

BY PROFESSOR RAMSEY.*

"On a Process for obtaining Lithographs by the Photographic Process," by Professor Ramsey. Professor Ramsey described a process by which Mr. Robert M'Pherson, of Rome, had succeeded in obtaining beautiful photo-lithographs, specimens of which had been hung up in the Photographic Exhibition in Buchanan-street. The steps of the process are as follows: 1. Bitumen is dissolved in sulphuric acid, and the solution is poured on an ordinary lithographic stone. The ether quickly evaporates, and leaves a thin coating of bitumen spread uniformly over the stone. This coating is sensitive to light, a discovery made originally by Mr. Niepce, of Chalons. 2. A negative on glass, or waxed paper, is applied to the sensitive coating of bitumen, and exposed to the full rays of the sun for a period longer or shorter according to the intensity of the light, and a faint impression on the bitumen is thus obtained. 3. The stone is now placed in a bath of sulphuric ether, which almost instantaneously dissolves the bitumen, which has not been acted upon by light, leaving a delicate picture on the stone, composed of bitumen, on which the light has fallen. 4. The stone, after being carefully washed, may be at once placed in the hands of the lithographer, who is to treat it in the ordinary manner with gum and acid, after which proofs may be thrown off by the usual process. Professor Ramsey then proceeded to state that the above process, modified, had been employed with success to etch plates of steel or copper, without the use of the burin: 1. The metal plate is prepared with a coating of bitumen, precisely in the manner noticed above. 2. A positive picture on glass or paper is then applied to the bitumen, and an impression is obtained by exposure to light. 3. The plate is placed in a bath of ether, and the bitumen not acted upon by light is dissolved out. A beautiful negative remains on the plate. 4. The plate is now to be plunged into a galvano-plastic bath and gilded. The gold adheres to the bare metal that refuses to attach itself to the bitumen. 5. The bitumen is now removed entirely by the action of spirits and gentle heat. The lines of the negative picture are now represented in bare steel or copper, the rest of the plate being covered by a coating of gold. 6. Nitric acid is now applied as in the common etching process. The acid attacks the lines of the picture formed by the bare metal, but will not bite into the gilded surface. A perfect etching is thus obtained.

* British Association. 1855. *Athenæum*.

NOTE ON SOLAR REFRACTION.

BY PROFESSOR PIAZZI SMITH.*

Amongst other interesting and important consequences of the dynamical theory of heat, Professor W. Thompson having deduced the necessity of a resisting medium, the condensation of this about the sun, and a consequent refraction of the stars seen in that neighbourhood, Professor Piazzi Smith had endeavoured to ascertain, by direct astronomical observation, whether any such effect was sensible to our best instruments. Owing to atmospheric obstructions, only three observations, yielding two results, had been yet obtained; but both these indicated a sensible amount of solar refraction. Should this effect be confirmed by more numerous observations, it must have important bearings on every branch of astronomy; and as the atmosphere at all ordinary observatories presents almost insuperable obstacles, the author pointed out the advantage of stationing a telescope for this purpose on the summit of a high mountain.

PHOTOGRAPHY IN THE CRIMEA.

Although photographic art has been already applied to an almost boundless range of subjects, it has produced nothing at all comparable in importance to the large collection of views now exhibiting at the gallery of the Water Colour Society, in Pall Mall East. The artist to whom we are indebted for this extraordinary illustration of the war is Mr. Roger Fenton, who, regardless of danger and difficulty, has spent the spring and summer of the present year in taking photographic views of every figure and every scene at the seat of war likely to prove of interest to the public, and has just returned to England with the results of his labours, which completely fill the large Pall Mall Gallery. Portraits, not only of Generals, but of obscure persons, illustrative of the present life in the Crimea, extensive landscapes, and characteristic interiors have all come in for a share of his attention, and have been transferred to paper with all the accuracy that belongs to the most modern of pictorial arts. As the pictures are nearly 300 in number, it may fairly be said that such a detailed representation of the state of existence about Sebastopol has never yet been presented to public inspection. We can only regret that Mr. Fenton did not remain a little longer on the borders of the Euxine, as he might then have had an opportunity of employing his talents and his industry in the interior of the now fallen city. The whole series is to be published under the patronage of the Queen, the Emperor of the French, and Prince Albert.

* British Association. 1855.

THE PROJECTILE CONTROVERSY.

To the Editor of the Mechanics' Magazine.

Sir,—I beg leave to request the favour of your inserting my paper "On the Optical Illusion of the Atmospheric Lens," &c., read in the mathematical and physical section, at Glasgow.* This paper will not only furnish your correspondent, "W.," with *some* of the facts he has solicited, but also will be of some service to mariners navigating the southern seas, and enable them to ascertain their longitude more correctly than by the established tables of semi-diameters. If your correspondent refers to No. 1669, page 107, he will find my parallelogram of the paths of projectiles, with the data, represented by dotted lines; that is, showing the gradual decrescent velocity in ascending to A by the projectile force, and the increscent velocity of the returning gravitating force; the two combined form the parallelogram, which he can prove by throwing up a ball. The second parallelogram is the objectionable one, and which your correspondent has figured in his last. We want the data on which the *oblique equal sides are founded.*

I have studied the world as it is in every zone, and have published the results of my observations, and am open to corrections; therefore, as my work has been for many years before the world, I ne d not occupy your valuable pages in making quotations. Mr. Mushet and myself have endeavoured to explain things as we find them; let our opponents show us our errors in a clear and intelligible language, such as all your readers can comprehend. Mr. Wilkinson states, in his last letter, that Sir John Herschel's hypothesis in the passage quoted was founded "on the action of gravity, as operating in *free space*," &c. I do not pretend to know what your correspondent means by "*free spaces*," &c.; but the language of Sir John Herschel cannot be mistaken: "All bodies, when raised into the *air* and quietly abandoned, descend to the earth. ...... But if we cast a body obliquely into the *air*, this tendency is materially modified. ...... When the stone which we fling obliquely upwards meets and is stopped in its descent by the earth's surface, its motion is not towards the centre, but inclined to the earth's radius *at the same angle as when it quitted our hand.*"

This stone, it will be observed, is thrown into the *air*, and not into *vacuo*. I would, therefore, recommend Mr. Wilkinson to reperuse the passages. Mr. Mushet's masterly letter, in No. 1675, page 252, remains unanswered.

I am, Sir, yours, &c.,

Evan Hopkins.

Thurloe-square, Sept. 24, 1855.

* Inserted on page 294 of this number.—Ed.

To the Editor of the Mechanics' Magazine.

SIR,—Allow me to acquaint your correspondent "W." that I fully appreciate the value of mathematics; but as an engineer I must have physical data for all theories, even when assumed by great mathematicians.

According to the laws of terrestrial physics, the *space described* is an exact measure of the *power consumed*. Who has been in a region where bodies can move uniformly without being propelled by a force? Since the time of Newton, the solar system has been found to be filled with a resisting medium; where is the *free space?* Since the days of Newton his corpuscular theory of light has been superseded by the undulatory theory; his law of doubled refraction has been displaced by that of Huygens; his theory of the inflexion of light has been forgotten for Hooke's; and his method of fluxions has been supplanted by the differential calculus of Leibnitz.

The theory of the tides is a mere burlesque. Are we to accept the dicta of mathematicians as infallible in this age of discoveries when so many of their theories are passing into oblivion?

I have already stated that we can prove experimentally that bodies projected in *vacuo* even, move at a decrescent velocity until the whole of the power is continued by the space described; and I want to know in what region bodies will continue to move without a force? We have as much right to demand proofs from the mathematicians as they have in demanding them from us.

I am, Sir, yours, &c.,

CIVIL ENGINEER.

London, Sept. 26, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—I must decline being placed in the chair by "W." to correct all astronomers. I have not the time, much less do I pretend to the capacity for so comprehensive a task. The observations to which I refer are not mine. I quoted them and gave my authority, which "W." says is "too bad;" but I really think it would have been "too bad" had I quoted anything so important without giving the authority. They are not communicated to a "chosen few," but have been before the public above ten years in the author's most original, and (I think) most important work on geology and terrestrial magnetism. I disclaim belonging to any "new school." I keep my mind open to receive any new truths, or any correction of old truths, a "temerity" which I admit it is much more difficult for those to exercise who have given pledges to the maintenance of old systems, and staked a reputation on their validity. Systems are one thing, the great facts of the creation to which those systems are applied, are a different thing perdurable, which have outlived many systems; and to believe that a perfect system has at last been framed is fettering the intellect, and uttering a futile mandate against the progress of truth. It is the unavoidable tendency of the human mind, when strongly and perseveringly enlisted in defence of a system, to shut out and disregard even the most startling facts, when they are in collision with it. I am in no way pledged to circular orbits, but the observations I have quoted are, *if correct*, as "W." will admit, a very great obstacle to elliptical orbits. I can assure him I received these observations with no favour, violating and disturbing as they did all previous prepossessions and instructions. An agreeable image of the heavens long impressed on the imagination is disarranged by substituting for a series of eccentric ellipses with axes at varying angles, the rigid lines of concentric circles, which are out of keeping with the analogy of the cometary orbits. But what is all this compared to a question of fact? I am quite aware the laws of refraction have been laboriously studied, but the question is, have they been correctly applied, without a leaning to the maintenance of system. If "W." will give a series of measures of the sun's diameter at the tropics, contradicting those I quote, the issue will then be raised between the accuracy of the observers. In matters on which I have some practical knowledge, which I do not pretend to have at all upon the details of astronomy, I have found Mr. Hopkins singularly correct, and am therefore inclined to rest on his evidence until it is overthrown. I was led to refer to this point in consequence of a late allegation, that *observation* was the basis of the mathematical theories; these would have to be regarded with increased suspicion if an error were detected at the centre as well as at the circumference of the great plan. We have incalculably increased means and facilities for correct observation. The extent and the accuracy of Kepler's observations with the most imperfect appliances have always been considered as little short of miraculous, and his perseverance and majestic fidelity have conferred on his philosophic memory an unparalleled greatness. That with instruments which would equally astonish and delight his venerable eyes, our observations should be more correct, there could be nothing surprising; what I consider to be astonishing is, that with such facilities, and researches into so many collateral mysteries of nature, so grave an error as the alleged varying magnitude of the sun should have remained up to the present day. *If it be an error*, it can only be

[redacted]

accounted for by the tendency to make observations coincide with the dictates of authoritative system. I am not answerable for the counter observations; they are not mine, but they are strongly warranted; and "W." will admit it is of some importance whether they are corrected or confirmed. I am obliged to "W." for the figures he has given me. I stated plainly I did not remember the particulars; I had no authority at hand to refer to, and merely hinted how much such observations on the sun's magnitude would interfere with the received notions on the equations of time. The rest of my letter "W." thinks is truly metaphysical. I regret it, for I always desire to write so as to be understood; but it is clear that until the outlines of the controversy are decided, there can be no prospect of filling in an unintelligible interior. The true issue is between the recognized laws of the composition and resolution of forces, and the alleged first law of motion. This issue has to be decided first before the consequences, which are very numerous, can satisfactorily appear in court. It is, in fact, the whole case raised in "W.'s" concluding algebra. The one law flatly contradicts the other; and it is the endeavour to force them into assent, and to form a "conception" of such an impossibility, that leads to the rejection of "self-evident propositions," which otherwise no one could dispute.

I am, Sir, yours, &c.,
DAVID MUSHET.

Sept. 25, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—Since this subject has been brought forward, investigated, and discussed, and is creating no small amount of interest amongst your readers, it is to be hoped that a definite decision will ultimately be arrived at.

In the last communication of your correspondent "W." we have a diagram illustrating the parabolic theory, and it is with regard to this diagram that I would make the following remarks.

The projectile is here made to describe *unequal* spaces in *equal* times, *in vacuo*, and subject to no other resisting force but that of gravitation. How can this doctrine be reconciled with that published in all our elementary works on mechanics? At foot of page 107, so frequently referred to, the parallelogram of the received doctrine shows *equal* spaces in *equal* times *in vacuo*. Again: with reference to "W.'s" diagram, it is shown that if gravitation were removed, the body would proceed in a direct course, in a straight line; but (according to "W.") would still describe *unequal* spaces in *equal* times, showing plainly that the propelling force is of an "evanescent character." So far as I have followed up the argument on both sides, this seems to be exactly what Mr. Hopkins maintains.

I am, Sir, yours, &c.,
MAXIMUS.

EXPANSIVE MARINE ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—Will you allow me to correct an error into which your correspondent, Mr. Carrett, has fallen in supposing my paper subsequent to his patent. My paper was read at Birmingham on the 25th of April, and my patent dates from the 17th of April. I have no desire to criticise Mr. Carrett's plans, but he will find that the idea of using steam "twice in the same cylinder," although perhaps original with him, as it was with me some years since, was carried out by Messrs. Gibbs and Deane in the construction of the engine for draining the Haarlem Meer. Whether the principle has been adopted in other cases I do not now remember, but it is the opinion of an eminent patent agent that it cannot now be made the subject of a patent. I will only add, that trunk engines have also been arranged with guides on the back-end of the trunk being passed through a stuffing-box; such guides being large piston-rods, and made available for oiling the joint at the foot of the connecting-rods.

I am, Sir, yours, &c.,
EDWARD E. ALLEN.

September 22nd.

To the Editor of the Mechanics' Magazine.

SIR,—I shall feel sincerely obliged to Mr. Truran if he will give me the names of the scientific journals in which the merits of Craddock's engines have been discussed, and the dates of discussion. I have for some years taken great interest in the matter, and have written a great deal to provoke discussion; for on a question of such importance I was anxious to have my views corrected by public criticism. But I have never met with any denial of their merits, and therefore concluded them past denial. Once or twice I have been taken to task for overrating the value of expansive steam; but that prejudice is vanishing, though I am aware it still benumbs the torpid energies of the Admiralty to a frightful extent. Mr. Truran has shown himself to be better informed. What I mean by asserting the perfect safety of Craddock's boilers is, that they inflict no injury in the case of explosion. When a locomotive boiler, or other boiler at 200 lbs. per inch pressure, explodes, it can hardly be said that persons in the immediate vi-

cinity are in perfect safety. In fact, we often hear of deaths from the explosion of the common great boilers, and the existence of a society to prevent such dangers, with Mr. Fairbairn at its head, indicates some defect in their security. The reason I referred to Craddock's slide valve was, because there is no steam pressure on the back, to avoid the inconvenience of which in a large valve at starting the engine was the object of Mr. Truran's invention. I am, Sir, yours, &c.,

DAVID MUSHET.

Sept. 25, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in the construction of printing-presses.* (A communication.) Patent dated March 2, 1855. (No. 467.)

Claim.—So hanging or balancing the bed which holds the form, and moves up and down for each impression, upon springs, as that its own weight shall compress the springs to a great extent, and the entire compression of them be completed by drawing the bed further down whilst in motion; and so that the elasticity of the springs when the bed is to rise will raise it up to the extent of their power, and the upward motion be completed by a separate arrangement, whilst in motion, for the purpose of relieving the machine from overcoming the inertia in moving the bed from a state of rest, the power to complete its motion being applied near the termination of its movement. Also, the arranging of the frisket and the inking rollers in separate carriages moving on the same ways, with such relative velocities as not to interfere with each other, and so that the frisket may carry off and bring back the sheet quickly, whilst the inking rollers may travel more slowly, and do more perfect work. Also, the pointing of the sheet whilst being prepared for receiving the first impression by an automatic movement attached to some moving portion of the press, and so that the operator may use both his hands in guiding and controlling the sheet. Also, the application of a blast of air, or its equivalent, for the purpose of forcing the sheets upon the registering points when the paper is being prepared for the reversed impression, so that the operator may use both his hands in guiding and controlling the sheet. Also, the removing of the sheet from the frisket or from the press by means of atmospheric pressure, or its equivalent, for the purpose of turning over the sheet in its delivery. Also, making the registering points adjustable in the paper tables by passing it through a friction plate secured between two plates, and so that it may be moved in any direction by a slight tap, for the purpose of allowing for the unequal shrinking or drying of the paper, or of any movement of the form after the first impression is taken. Also, the combination of an open toggle and adjustable eccentric shaft or pin, which operate the bed, for the purpose of regulating the impression, by increasing or diminishing the distance between the bed and platten.

CONEY, JOHN, of Newhall-hill, Birmingham, Warwick, gun-maker. *An improved construction of gun-lock.* Patent dated March 2, 1855. (No. 468.)

The trigger is so arranged in this lock with respect to the seer (upon which it acts to discharge the piece) that when the lock is at half cock the trigger will be out of reach of the seer, and therefore, if accidentally pulled, will not act upon the lock.

WOODLEY, JOHN, and HENRY HERBERT SWINFORD, of Limehouse, Middlesex, coopers. *Improvements in apparatus for indicating and giving alarm in cases of fire.* Patent dated March 3, 1855. (No. 469.)

This invention refers to a peculiar application of gutta percha or similar tubing, charged with atmospheric air or gas, and communicating with the several parts of ships, dwelling-houses, or other places, to be protected thereby, which tubes, being connected with a suitable alarum and dial or index, are arranged to indicate the locality of accidental fire.

DICKINSON, BENJAMIN, and JOHN PLATTS, of Clough House Mill, near Huddersfield, York, cloth dressers. *Improvements in machinery or apparatus used in finishing woollen and other textile fabrics.* Patent dated March 3, 1855. (No. 471.)

This invention relates to "raising gigs," and consists—1. In the application and use of cards instead of teazles on the revolving cylinder thereof. 2. In lifting or removing from contact with its driver the piece roller whilst delivering or letting off the fabric; and, 3. In the use of a toothed roller or brush for cleaning the cards whilst the machine is working.

HUNT, WILLIAM, of Tipton, Stafford, manufacturing chemist. *Improvements in utilizing certain compounds produced in the process of galvanizing iron, and in the application of the same and similar compounds to certain useful purposes.* Patent dated March 3, 1855. (No. 472.)

This invention consists in the use of chloride of zinc in place of salammoniac in coating iron with zinc, and in the use of a solution of chloride of zinc for steeping the iron in after cleaning it and previous to its being galvanised.

JOHNSON, WILLIAM, of Lincoln's-inn-

[redacted]

fields, Middlesex, civil engineer. *Improvements in cleansing and preparing fibrous materials.* (A communication.) Patent dated March 3, 1855. (No. 474.)

According to one modification of the improved apparatus, the first scutcher or disintegrating action to which the cotton wool is introduced in the usual way, by means of an endless feed cloth and pair of feed rollers situated at the upper part, and to one side, of the scutcher drum, consists of a set of bars fixed upon arms carried by a rapidly-revolving shaft. These scutcher bars are formed with serrated edges, and a large portion of the drums inside which the scutcher revolves, consists of a series of moderately sharp-edged bars lying parallel to the scutcher shaft in such a manner as to present a serrated appearance in transverse section on the inner side. The drum is cast in segments, the bars composing it being set at slight distances apart and connected by cross pieces, so as to leave interstices through which the heavier and coarser dust from the cotton wool is thrown out by the scutching action. The cotton wool is thrown out of the scutcher drum through a passage at the upper part of the drum and at the opposite side to that of the feed rollers, and enters a dome or chamber formed by metal gratings through which the fine dust is exhausted from the cotton wool by means of a fan revolving at a high velocity. This exhausting dome or chamber is situated over the second scutcher. The cotton wool enters the chamber at one of its lower corners, whilst the remainder of the chamber's floor or bottom is taken up by sets of feed rollers, which conduct the cotton wool into the second scutcher drum when it falls upon them. Several pairs of feed rollers are employed at separate points round the periphery of the drum, so as to introduce the cotton wool simultaneously in several streams, whereby the second scutcher is made to act much more effectively than in cases where the cotton wool enters the drum in a single stream only. The beater bars of the second scutcher are constructed in a manner similar to those of the first scutcher, that is to say, with serrations on their acting edges, and the lower portion of the second scutcher drum is also made like the first scutcher drum as already hereinbefore described, it being obvious, however, that the proportions of the parts may be modified if necessary. The cotton wool is thrown by the second scutcher into a trough or duct in the usual manner, and may be subsequently treated as in ordinary machines of a similar class.

BOBY, ROBERT, of Bury St. Edmunds, machinist, and THOMAS COOPER BRIDGMAN, of the same borough, Suffolk, chemist, *Improvements in corn-dressing and winnowing machines.* Patent dated March 3, 1855. (No. 478.)

These improvements refer to the addition of a board or plate to the shoe or riddle of corn-dressing and winnowing machines; also to a peculiar construction of screen for the same which clears itself without allowing the refuse to escape; and likewise to an arrangement of spindle for applying the driving winch on either side of the machine, and to the application of a metal strap or chain band.

CARTER, TIMOTHY WALKER, of Massachusetts, United States of America. *New and useful improvements in repeating fire-arms.* (A communication.) Patent dated March 3, 1855. (No. 479.)

This invention consists in an arrangement and combination of a trigger, a spring, a rotary tumbler separate from the trigger and moving on a separate pin, &c., by which during, and by means of, a back and forward movement of the trigger, the cylinder will be locked or unlocked, and have an intermittent rotary motion imparted to it, and the cock or percussion hammer be actuated.

ILES, CHARLES, of Peel Works, Birmingham, Warwick, manufacturer. *Improvements in apparatus for cutting, burnishing, and polishing cylindrical surfaces of metal and other substances.* Patent dated March 3, 1855. (No. 480.)

"This invention consists in constructing a cutting die to be used when drawing tubes or rods, and also rotatory cutters, burnishers, and polishers, to revolve with a pulley or drum on a hollow fixed axis. For which purpose in constructing a cutting die a plate of steel is used with the hole or passage through it, and a second plate is also used having a conical entrance fixed to such first mentioned plate, so that the two smaller diameters of the two plates come together, and the cutting die is slightly less in diameter than the smaller diameter of the hole in the entering plate, whereby when tubes or rods are drawn through such a die a thin shaving will be cut off. When cutting and burnishing or polishing simultaneously the rods or tubes are moved progressively through a hollow fixed axis, and when their lengths require it they are supported at intervals. The cutting and burnishing or polishing tools are fixed to a revolving drum or pulley, which is caused to rotate on the fixed hollow axis."

ILES, CHARLES, of Peel Works, Birmingham, Warwick, manufacturer. *Improvements in the manufacture of tubes, knobs, and handles of doors, rollers of castors, and reels for cotton or thread.* Patent dated March 3, 1855. (No. 481.)

Claim. — The manufacture of covered tubes, knobs, and handles of doors, rollers of castors, and reels for cotton and thread, by casting or moulding them of plaster of Paris or gypsum.

GLEDHILL, JOHN, of Congleton, Cheshire, machine-joiner, and ROBERT GLEDHILL, of Halifax, York, mechanic. *Improvements in the preparation of silk, flax, and other fibrous substances, and in the machinery or apparatus employed therein, part of which is applicable to the preparing of wool for combing.* Patent dated March 5, 1855. (No. 482.)

Claims.—1. The preparing of silk or other fibrous substances without looping, or with "two tail ends." 2. The use and application of a cylinder with combs capable of sliding in and out. 3. Apparatus to form a continuous web or lap.

PAINE, LEWIS JAMES, of Camberwell, and JOHN RYAN, of Hatcham. *Improved portable utensils, such as buckets, canteens, baths, and other similar waterproof articles for containing liquids, also applicable for portable life-boats, buoys, or land-marks, and other compressible articles.* Patent dated March 5, 1855. (No. 483.)

This invention consists in making such vessels of India-rubber, leather, cloth, or other elastic or non-elastic material impervious to liquid, so as to be self-supporting and self-adjusting, and of any form required, the latter being produced by means of a skeleton spiral or other spring or springs.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in coating iron and steel wire with other metals or alloys.* (A communication.) Patent dated March 5, 1855. (No. 484.)

In carrying out this invention the wires to be operated upon are wound upon vertical reels situated at one extremity of the machine; from these reels they pass through a double vessel containing a solution of double chloride of zinc and ammonia, or a simple solution of chlorhydric or hydrochloric acid diluted with water. The second portion of this vessel serves to receive any acid which may drop from the wires after immersion and during their passage through cushions attached to the vessel, from which cushions the wires proceed to the metal bath, whether of zinc or tin or other metallic alloy, the molten metal being contained in a cast-iron or other suitable vessel placed immediately over a furnace. On leaving this bath, the wires are entirely coated with metal, and they are then passed through two steel gauge-plates which remove any superabundant amount of metal and produce the smoothness of surface desired. The wires thus coated are then instantly cooled by a number of jets of cold water.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in projectiles.* Patent dated March 5, 1855. (No. 487.)

A full description of this invention was given on page 267 of our last Number.

GARNIER, ARSENE LOUIS, of Guernsey, photographic artist. *An improved process for producing photographic pictures, which he intends to denominate "Système Garnier de Photocherographie coloriée."* Patent dated March 5, 1855. (No. 488.)

This invention consists—1. In employing a textile or woven fabric instead of paper to receive photographic pictures; and the inventor having found by experience that photographic pictures are liable to fade away, and that this defect arises from the presence of certain salts or matters in the fabric employed to receive the picture, he proposes, 2. to subject the fabric to the operation of boiling water, which will neutralize, destroy, or remove the deleterious or injurious matters, and prevent them from operating on the chemical substances employed in the photographic process.

LEWIS, JOHN, of Elizabethtown, New Jersey, United States of America. *Improvements in rigging and sparring vessels.* Patent dated March 5, 1855. (No. 489.)

This invention relates to a peculiar mode of constructing and working a set of yards or spars connected by framework so as to move on a centre or pivot, the said frame being balanced on a pivot, so as to turn easily thereon, and also receiving sails so set as to present nearly the same extent of surface on each side of centre, and thus be balanced in their action.

DE GUINON, RICHARD VAN VALKENBURGH, of Brooklyn, New York, United States of America. *Improvements in anchors.* Patent dated March 5, 1855. (No. 490.)

Claim.—Fitting moveable flukes of large area to an anchor so as to adapt the same for holding in soft or sandy soil.

WOOD, JAMES, of Barbican. *Improvements in ornamenting woven fabrics for book-binders and others.* Patent dated March 5, 1855. (No. 492.)

Claim.—Applying Dutch-metal leaf to woven fabrics by printing with adhesive composition on the fabrics, and then laying the metal leaf on the printed surface.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Certain new and useful improvements in the oscillating steam engine.* (A communication.) Patent dated March 5, 1855. (No. 493.)

"This invention consists, firstly, in the employment of ports and valves in or around both trunnions of the cylinder, through which the steam enters the cylinder on both sides at the same time, and from points

opposite each other, and thus the steam counteracts and balances itself, and prevents the friction and strain which is occasioned by taking in the steam on one side only at a time. I make the trunnions on which the cylinder oscillates of conical form tapering from the cylinder, and fit to them conical seats; and this invention consists, secondly, in making the trunnion bearings adjustable to the trunnions by set screws so applied as to adapt the conical trunnions to their conical seats, to tighten the valve and compensate for the wearing by friction, should the friction in its seat render it necessary."

HYDE, WILLIAM, of Spring-hill, Ohio, United States of America. *Improved marine life-preserving apparatus.* Patent dated March 6, 1855. (No. 494.)

This invention consists in the construction of a life-preserving apparatus sufficiently buoyant to float as many persons as it will contain, its component parts being so made and put together that, when not required for life-preserving purposes, they may be used as packing-cases, trunks, lockers, arm-chests, or other articles of ship furniture.

TARDIF, EUGÈNE, of Bruxelles, Belgium, merchant. *An improved construction of numbering apparatus.* Patent dated March 6, 1855. (No. 501.)

The object of this invention is to facilitate the printing of consecutive numbers from hand stamps. For this purpose the inventor applies to the hand stamp or numbering apparatus a contrivance for turning the numbering discs during the transit of the apparatus (after each impression) from the article stamped to the inking pad to take up a fresh supply of ink.

KENNEDY, JOHN, of Liverpool, Lancaster, boot and shoemaker. *Improvements in the manufacture of boots and shoes.* Patent dated March 7, 1855. (No. 502.)

Claims.—1. The use of an apparatus for making boots and shoes placed on a bench which enables the operator to work in an erect or easy position. 2. The use of metal pins, nails, or rivets in conjunction with metal lasts. 3. The use of metal plates and chisels to cut soles and insoles. 4. The use of metal heels with top pieces of leather, gutta percha, or other similar material.

COOPER, JOSEPH, of Birmingham, Warwick, brace and bit manufacturer. *Certain improvements in joiners' braces, and in the mode of forming or partially forming the various bits to be used with such, or any other kind of brace.* Patent dated March 7, 1855. (No. 504.)

This invention comprises certain improvements in the form of the spindle or mount which unites the head to the stock and on which the head works, it being shaped of a parabolic form, curving outward at the base, for the purpose of providing a sufficient bearing for the neck, and equalizing the friction generated from the pressure and action on the head while in use; also, the use of a screw pin for preventing the spindle or mount unscrewing from the head; also the use and form of a plate for regulating and equalizing the friction in the back action of such braces when in use, and in the use of a hole or holes through such plate, by which its working surfaces and the spindle first described may be lubricated, &c.

WEILD, WILLIAM, of Manchester, Lancaster, machinist. *Improvements in looms or machinery for weaving pile fabrics.* Patent dated March 7, 1855. (No. 505.)

This invention relates to the machinery patented by Mr. Weild, October 21, 1852, and embraces many improvements, the primary of which consist in making the trough which carries the wire while it is being inserted in the shed with a number of small slide pieces, which act as supports to the wire when in the trough, but which will retire to allow the picker and piece or hook on the end of the wire to pass them, being brought again into a position to support the next wire by springs attached to the trough; and in making the troughs undercut to admit of an increase of the breadth of that part of the picker or pusher pushing against the hook or piece at the end of the wire, &c.

SLOUGHGROVE, JOHN WILLIAM, and JAMES HENRY WHEATLEY, of Windsor-street, Islington, engineers. *Improvements in smoke-consuming furnaces.* Patent dated March 7, 1855. (No. 507.)

The improved furnace is fitted with two sets of fire bars slightly inclining upward towards the back; at the end of the further set of bars is fitted a perforated bridge, below which a door is fitted, in order to afford access to the space behind the bridge, for the purpose of cleaning out the same. Between the front and back set of fire bars is fitted a movable bridge or partition attached to a lever, so that it may readily be moved up and down by the stoker in charge of the furnace. When the bridge or partition between the bars is lowered access may be readily had to the back or further set of bars, and while the furnace is at work a brightly glowing fire is to be kept on this grate by pushing back the incandescent fuel from the front grate. After the further grate has been supplied the bridge is lifted, and all communication cut off between the two fires, except through the holes or perforations in the bridge or diaphragm. The front fire is supplied with fuel in the ordinary manner. When fuel is thrown on to the fire a large quantity of unconsumed gases and smoke are immediately evolved, which

instead of being allowed to escape at once to the flue or shaft are arrested by the perforated bridge, which is so constructed that a current of air is caused to be mixed with the smoke, which then passes through the perforations in a series of streams on to the second fire.

BATAILLE, BARTHELEMY LOUIS, civil engineer, of Paris, France. *Improvements in looms for weaving pile fabrics.* Patent dated March 8, 1855. (No. 512.)

Claims.—1. The using in looms, by which Jacquard apparatus are employed, of two or more Jacquards, which are permitted to work separately, or entirely or partly simultaneously, but independently of each other. 2. The employing in all sorts of looms of a mode of weighting the headles, or of giving less weight to certain parts of the loom, by means of double eccentric pulleys. 3. The application to all sorts of looms of the reduction of the opening of the shed to the size only which is required for allowing the shuttles to pass by means of different ascensions of the jack levers according to the pick, &c.

WALKER, THOMAS, of Birmingham, Warwick, engineer. *Improvements in rotary engines, to be worked by steam or other fluid.* Patent dated March 8, 1855. (No. 514.)

This invention primarily consists in forming the main axis which carries the piston of a conical in place of a cylindrical form at the bearings, and in forming the bearings with collars or linings of a conical figure internally, to correspond with the conical parts of the shaft, by which arrangement when by wear those parts of the engine have become loose they may be made to fit closely, by simply sliding the collars or linings along the shaft into the bearings.

CLAUDET, ANTOINE FRANÇOIS JEAN, of Regent-street, Middlesex, photographic artist. *Improvements in stereoscopes.* Patent dated March 8, 1855. (No. 515.)

This invention consists—1. In giving a curvature to the interior of the outer casing of stereoscopes, and in providing them with interior chambers, so as to greatly reduce the reflection which takes place in ordinary stereoscopes, and to shut out from the sight of the observer all extraneous objects. 2. In the adaption of the lenses so as to obviate the necessity of any adjustment to suit observers whose eyes are at different distances apart. 3. In obtaining, by means of an index, the ready adjustment of the foci of the eye-pieces to the three usual varieties of sight. 4. In the application to stereoscopes of a revolving frame or frames carrying a series of slides, whether caused to revolve by hand, or by suitable machinery. 5. In shutting off the sight of the revolving frame while the pictures are being changed, by means of the rising and falling of a shutter. 6. In the use of central parts of whole lenses for the eye-pieces, thus avoiding the distortion of objects.

HAZELDINE, GEORGE, of Lant-street, Southwark, Surrey, coach-maker. *Improvements in wheel-carriages and in the wheels thereof.* Patent dated March 8, 1855. (No. 516.)

The inventor forms a horizontal framing which rests upon the axles of the wheels without the intervention of springs, such axles being short, one for each wheel, and formed as fixed centres that do not themselves rotate, but have the wheels turning upon them, whereby he dispenses with the use of bearings or journals which are ordinarily required where short axles are employed. The body of the vehicle which is encompassed by the framing, and rests upon or is suspended from it by means of half springs, can thus be brought much lower and nearer the ground than it is generally placed, without the use of cranked axles.

KRUPP, ALFRED, of Essen, Prussia, cast-steel manufacturer. *Certain improvements in the construction of railway-wheels.* Patent dated March 8, 1855. (No. 517.)

Claim. — The construction of railway-wheels, by a combination of a solid cast-iron disc with a wrought-iron, or wrought, or rolled steel tyre affixed thereto by shrinking, by bolts and nuts, or by any other suitable means.

GILBERT, HENRY, of Kensington, Middlesex. *Improvements in hurdles.* Patent dated March 8, 1855. (No. 520.)

The objects of these improvements in hurdles is to facilitate their transport, and the better fixing of them to the land. For these purposes one of the uprights of each hurdle is made with a fork, and each limb of the fork is recessed, so as to receive the axis of a wheel made with a fixed axle; or in place of attaching the wheel to a fork a projecting axle may be formed on the upright, and a wheel placed and retained thereon. By these means the wheel will be separate and may be applied to and removed from a hurdle quickly. And in order that hurdles may be retained in an upright position, when in use, each hurdle is made with supporting diagonal bars, hinged or pin-jointed to the uprights, and also to horizontal bars in each of which is made an eye through which the upright of the hurdle passes.

AITKEN, JOHN, and SERVETUS AITKEN, manufacturers, and JOHN HASLAM, manager, all of Bacup, Lancaster. *Improvements in machines used for preparing, spinning, and doubling cotton, wool, flax, silk, and other fibrous materials.* Patent dated March 8, 1855. (No. 521.)

The main object of this invention is to twist slivers or threads and wind them up in a cop or bobbin form, and is accomplished by arranging and fixing the spindles of machines in three independent bearings (in place of two), one of which bearings may be fixed in the copping rail (in those machines requiring one), or an independent copping rail may be employed in combination with the three bearings.

NORTON, JOHN, of Dublin, Ireland, esquire. *Improvements in fire-arms and ammunition.* Patent dated March 8, 1855. (No. 522.)

In carrying out the inventor's system of firing, a spring movement is fitted up at the muzzle or mouth of the gun, and is made to act upon a "Vesuvian" match or other similar ignition contrivance, in such manner as to direct a shower of strong sparks down the muzzle to the bottom or towards the breech of the gun, where a few grains of loose gunpowder catch the sparks and fire the charge.

FOSTER, WILLIAM, of Black Dike Mills, near Bradford, York, spinner and manufacturer. *Improvements in machinery or apparatus for cleansing wool and other fibrous materials.* Patent dated March 8, 1855. (No. 524.)

This machine consists of a slightly inclined wire grating or perforated plate whereon the fibrous material rests, passing gradually over it. This wire grating or perforated plate is kept in constant vibratory motion by a tappet wheel which gives the necessary shaking motion required for freeing the material from extraneous matter: two or more fan blowers are also connected with this shaking machine, the one for the purpose of exhausting the dust from the machine, and the other for blowing through.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture of boots and shoes, or other coverings for the feet, and in the machinery or apparatus to be employed therein.* Patent dated March 8, 1855. (No. 525.)

This invention consists in manufacturing boots and shoes by so cupping or shaping the uppers or counters, and parts applicable to the heels and toes, that when the uppers are "lasted" the said parts will fit close over and lie upon the heel and toe portion of the last and inner sole, without the necessity of scoring, plating, or packing between the inner sole and the parts of the upper referred to.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

VABRE, ANDRE BERNARD, of Saint Thomas-street East, Surrey, civil engineer. *Improvements in floors and roofs.* Application dated March 3, 1855. (No. 470.)

The inventor constructs floors and roofs of a series of flat arches of hollow pieces of pottery supported on wrought-iron girders. The pieces of pottery are square at their upper ends, and have their corners removed at their lower ends, which are rather smaller in diameter than the upper ends, so as to form a flat arch when placed together.

RYLAND, THOMAS HENRY, of Birmingham, Warwick, manufacturer. *An improvement or improvements in the manufacture of neck and dress-chains, bracelets, and other ornamental articles of dress, and in links used in the manufacture of the said chains and other ornamental articles of dress.* Application dated March 3, 1855. (No. 473.)

My invention consists in making the said chains and links of wood, instead of jet, and other materials of which they are usually made.

REVELL, JOSEPH, of Dukinfield, Chester, plasterer. *Certain improvements in machinery or apparatus for propelling vessels.* Application dated March 3, 1855. (No. 475.)

This invention consists in providing each paddle or float of a paddle-wheel with a shaft or axis having at one end a spur pinion, the whole being geared with one large spur-wheel connected by other suitable gearing with the main or driving shaft so as to keep all the floats vertical.

WILLIAMS, JOHN OCTAVIUS, of Torquay, Devon, ironmonger. *Improvements in camp-stoves and cooking-apparatus.* Application dated March 3, 1855. (No. 476.)

This invention was described at length on page 368 of our last volume, No. 1654.

METCALFE, THOMAS, of High-street, Camden-town, Middlesex, gentleman. *Improvements in window-sashes.* Application dated March 3, 1855. (No. 477.)

This invention consists in forming the upper and lower sashes of an ordinary window as follows: "the lower sash has a groove at each of the two vertical edges and at the bottom, and where it is connected at one vertical edge by hinges to the sliding-piece works in the ordinary groove of the window frame, this groove being formed into a dovetail groove so as to allow the said sliding-piece which is dove tailed to work therein; the grooves in the sash fit on to tongues, one on the sliding-piece to which the sash is commonly hinged, one on the inner sill of the window-frame, and one on another sliding-piece (of the same form as that above stated), which sliding-piece is in the groove of the window-frame opposite that to which the sash is hinged. The upper sash is the same as the lower one except that instead of the groove at the bottom it has a

groove at the top fitting on to a tongue at top of the window-frame."

DAWSON, JOHN, of Northwich, Chester, saddler. *An improvement in saddles.* Application dated March 5, 1855. (No. 485.)

This invention consists in enabling the saddle to fit any horse by means of metallic plates affixed to the saddle-tree, these plates being capable of adjustment to the horse's back by screws.

HOTCHKISS, ANDREW, of New York, United States. *Improvements in projectiles.* Application dated March 5, 1855. (No. 486.)

A full description of this invention will shortly be given.

JENKINS, WILLIAM, of Neath Abbey, Glamorgan, moulder. *An improved method of casting copper cylinders, copper vessels, and other copper forms.* Application dated March 6, 1855. (No. 495.)

The inventor employs a mould of iron, sand, loam, or other suitable material made in three principal parts, viz., the bottom, the outside jacket or mould, and the core. The core is supported at one end by a pin in its centre falling into a hole in the bottom, and at the other end by another pin passing through a cross head attached to the outer mould, so that the core is held in a suitable position in relation to the outer mould; the space between the core and the outer mould is to be made close at one end, and at the other to be open, so that a continuous passage or "git" is provided for the flow of the melted metal into the mould, a sufficient supply of which is to be kept up to keep this "git" closed, so that the space between the inner surface of the melted metal and the end of the chamber intended to receive it shall be excluded from communication with the atmosphere at the opposite end to the inlet or "git" end; a communication is to be made with a partially exhausted chamber or an exhaust-pump or pumps, so that the air in the chamber between the surface of the melted metal and the end of the mould may be kept in a partially exhausted state in order to facilitate the flow of the melted metal into it.

PARSONS, PERCEVAL MOSES, of Duke-street, Adelphi, Middlesex, civil engineer. *Certain improvements in fire-arms and projectiles.* Application dated March 6, 1855. (No. 496.)

This invention mainly consists in making the bore of fire-arms of an improved form, "the section of which would be described by a revolution of a volute or spiral or similar curve having its ends joined by a radial line, or by the partial revolution of two or more such curves having their adjacent ends joined by a corresponding number of radial lines."

BOWLSBY, GEORGE WASHINGTON, of the Castle Hotel, Oxford-street, Middlesex. *An improvement in closing the windage when discharging cannon.* Application dated March 6, 1855. (No. 497.)

This invention consists in closing the windage when discharging cannon by employing a cup of soft inelastic metal introduced previously to the ball or projectile.

PLAYER, JOSEPH, and LUKE DUNCAN JACKSON, of Winchester-buildings, London. *Improvements in the construction of furnaces for the prevention of smoke.* Application dated March 6, 1855. (No. 498.)

These improvements consist principally in the adaption to furnaces of an additional or auxiliary set of fire bars, in combination with a hopper for containing fuel, the hopper and fire bars being placed in front of the ordinary dead plate and fire bars of the furnace, and at the outside of the brick work or setting thereof, the improvements being designed more particularly for furnaces in which turf peat, or other similar description of fuel is employed.

BURR, ADAM JOHN, of Alfred-road, Paddington, Middlesex, civil engineer. *Improvements in gas-meters.* Application dated March 6, 1855. (No. 499.)

This invention relates to wet gas-meters, and the main feature of it consists in the use of an outside metallic casing which is divided into three compartments or chambers, by vertical divisions, which permit the water in all the chambers to communicate, the two end chambers being of equal size, and much larger than the central one, which contains within it in proper sub-compartments the inlet, exit, and syphon pipes; in each end chamber is placed a measuring cell which is inserted and has its mouth always immersed in water. These cells rise and fall vertically through a certain given distance comprehended between fixed points.

LAWSON, THOMAS, engineer, and MATHEW THOMPSON, fire-brick manufacturer, of Gateshead-on-Tyne. *Improvements in the consumption and prevention of smoke.* Application dated March 6, 1855. (No. 500.)

This invention consists in the construction of a number of narrow flues of fire-brick behind the back part of the furnace, and underneath the bottom of the boiler. These flues or passages are placed one above the other, and air is admitted to the furnace from the lower through the upper flues.

HIGGINS, JAMES, of Salford, Lancaster, machine-maker, and THOMAS SCHOFIELD WHITWORTH, of the same place, mechanic. *Improvements in the manufacture of small-arms, part of which improvements is also applicable to hardening other articles of metal.* Application dated March 7, 1855. (No. 503.)

This invention relates—1. To the manufacture of musket "bands"; in order to effect which the inventors employ a machine which severs the right length of material, and joins the ends, after being bent round with a scarphed or half-lapped point. 2. To the construction of machinery for making bayonet locking rings. 3. To the employment of a frame for hardening bayonets, swords, &c., by the use of which the weapons to be hardened are equally immersed on each side in the cooling liquid.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of hard India-rubber, and of articles composed of that material.* (A communication.) Application dated March 7, 1855. (No. 506.)

These improvements consist in hardening the soft Indi-rubber, or articles composed of soft India-rubber, by immersing them in a bath of melted sulphur contained in an open vessel, in place of submitting them to the action of sulphur in a closed vessel under steam pressure.

WILSON, JOHN, of Hurlet, Renfrew, and JOHN HORSLEY, of Cheltenham, in the county of Gloucester, analytical chemist. *Improvements in the manufacture of iodine and iodides, and of a pigment or pigments from certain residual products in such manufacture.* Application dated March 7, 1855. (No. 510.)

This invention consists—1. In the employment of chromates and bichromates of the alkalis, soda, or potash, in conjunction with any mineral acid, for effecting the precipitation of iodine from its solutions. 2. In the use of nickel and zinc in the manufacture of iodides of the metallic bases potassium and sodium. 3. In the manufacture of a certain pigment or pigments in enamel colours from the residual liquors.

FLECHELLE, BARTHELEMY LOUIS FRANÇOIS XAVIER, gentleman, of Paris, France. *Improvements in flat-purses (porte-monnaies.)* Application dated March 8, 1855. (No. 511.)

These improvements consist in applying to one or both of the outer sides of a flat purse a small box, which can be used as a snuff-box, or for other purposes.

REITHEIMER, GUSTAV CHARLES, of Holyhead, Anglesea, North Wales, civil engineer. *Improvements in the means of loading or discharging fire-arms.* Application dated March 8, 1855. (No. 513.)

The inventor proposes to fix the percussion cap to the cartridge, so that on the latter being taken from the pouch, the one hand shall hold the percussion cap and cartridge. The soldier or sportsman will then place the cap on the nipple, and withdrawing his hand, will proceed to load the fire-arm. To the cap is attached a minute piece of copper wire which tears the cartridge paper, and prevents the necessity of biting it.

BROOKS, JAMES, of Bury, Lancaster, mechanic, and WILLIAM STEPHEN WALTER, of the same place, millwright. *Improvements in looms for weaving.* Application dated March 8, 1855. (No. 518.)

This invention consists in the application of suitable mechanism connected to the "swell," for the purpose of drawing it back, and removing pressure from the shuttle, previously to the picking taking place.

TAYLOR, JOHN, of Spring-grove, Isleworth, Middlesex, architect. *An improvement in packing and preserving eggs and other articles of food.* Application dated March 8, 1855. (No. 519.)

This invention consists in placing eggs and other articles of food into moulds, and filling up the latter with plaster of Paris, so as to completely enclose them in moulded blocks of the plaster.

FOSTER, WILLIAM, of Black Dike Mills, near Bradford, York, spinner and manufacturer. *Improvements in machinery or apparatus for drying wool and other fibrous substances.* Application dated March 8, 1855. (No. 523.)

This invention consists in the employment of a steam chest, filled with a number of vertical tubes or pipes, which open at the bottom into a cold air chest, and at the top into a hot air chest, on the top of which is fitted a perforated plate or wire grating, for the wool or other fibrous material to dry on.

PROVISIONAL PROTECTIONS.

Dated June 5, 1855.

1287. Alexander Morton and Edmund Hunt, of Glasgow, Lanark, mechanical engineers. Improvements in motive power engines.

Dated July 20, 1855.

1639. William Armand Gilbee, of South-street, London, gentleman. The employment of a new material in the manufacture of paper. A communication.

1645. Francis Moll, of Annaberg, near Godesberg, Prussia. The employment of new materials in the manufacture of paper.

Dated July 23, 1855.

1663. Charles Goodyear, of Avenue-road, St. John's-wood, London. Improvements in the manufacture of wheels for carriages and other vehicles where India-rubber is used.

1665. Charles Goodyear, of Avenue-road, St. John's-wood, Middlesex. Improvements in bands or straps for confining or holding papers or documents and other articles where India-rubber is used.

Dated August 11, 1855.

1823. Thomas Hewitt, of Lorn-street, Chester-road, Manchester, pattern maker. Improvements in machinery for pulverizing and levigating by means of pestle and mortar.

Dated August 16, 1855.

1865. William Hudson, of Burnley, Lancaster, machinist. Certain improvements in the construction of stop rods or protecters in power looms for weaving.

Dated August 18, 1855.

1875. Robert Crawford, of Beith, Ayr, merchant. Improvements in ornamental weaving by Jacquard looms.

Dated August 25, 1855.

1930. Adam Hall Hardy and Jacob Hardy Fordoff, of North Brierley, York. A compound pill and ointment for the cure of scorbutic and similar disorders of the human body.

Dated August 30, 1855.

1956. John Gedge, of Wellington-street South, Middlesex. Improvements in galvanizing substances. A communication from Jacques Joseph Hyppolite Mailly, of Paris.

Dated September 1, 1855.

1974. Alfred Mortimer Job, of Halliford-street, Lower-road, Islington, Middlesex, and Edwin Tomlinson, of Barn's Cray, Crayford, Kent. A new article to be called "India-rubber leather cloth," applicable to covering roofs, floors, trunks, and for other similar purposes.

Dated September 5, 1855.

2008. William Craymer, of Bristol, Gloucester, carver. Improvements in propelling vessels.

2010. Agostino Palmiéri and Jean Baptiste Ferrari, of Rue de l'Echiquier, Paris, France. A new system of construction of ships or vessels. A communication from J. B. Paganini, of Genoa.

2012. George Peacock, of Gracechurch-street, London, merchant and ship owner. Improvements in ship building.

2014. Ichabod Nettleship, of Derby, overlooker. An improved spindle for the spinning of silk or other fibrous material.

Dated September 6, 1855.

2016. Theodore Schwartz, of New York, United States. An improvement in heating or cooling aeriform and liquid bodies.

2020. William Armand Gilbee, of South-street, London, gentleman. An improved process and apparatus for the purification and clarification of oils. A communication from M. Laffon, of Paris.

Dated September 7, 1855.

2022. Selby Hand, of Glinton Iron Works, Glinton, Northamptonshire. An improved combined cake-crushing, oat-bruising, and bean-splitting mill.

2024. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in casting mortars, cannon, and other hollow articles. A communication from John Webster Cochran, of New York.

2026. John Stewart, of Preston, Lancaster, boiler maker. Improvements in the construction of steam boilers for the more effectual consumption of smoke.

2028. Louis Dameron, of Paris, coach manufacturer. Improvements in the construction of carriages.

Dated September 8, 1855.

2030. Henry Hart, of Waterloo-crescent, Dover, Kent, gentleman. Certain improvements in the manufacture and composition of lubricating and burning oils. A communication.

2034. Henri Boucherie, chemist, of Bordeaux, French empire. Certain improvements in machinery for impregnating woods with chemical materials for their preservation and coloration.

2036. Anguish Honour Augustus Durant, esq., of Tong Castle, Salop. Improvements in apparatus for raising and lowering weights, and for saving persons and property from fire.

2038. Anguish Honour Augustus Durant, esquire, of Tong Castle, Salop. Improvements in apparatus for ascertaining the number of, and distance travelled by, passengers in public carriages.

2040. Anguish Honour Augustus Durant, esquire, of Tong Castle, Salop. Improvements in apparatus for sweeping and cleaning chimnies.

2042. Henry Webster, of Dalby-terrace, City-road, watch manufacturer. An improvement in the construction of chronometers, clocks, watches, and other time-pieces.

2044. Jean Panet, gentleman, of Echenoz-la-meline, near Vesoul, French empire. An improved hydraulic system for propelling on railways, or obtaining motive power and distributing water.

Dated September 10, 1855.

2046. Charles Hewett, of King's-road, Pentonville, Middlesex, chocolate manufacturer. Certain improvements in baking-ovens.

2048. John Rhodes and John Johnson, of Manchester, engineers. Certain improvements in steam engines, part of which is applicable to pumps.

Dated September 11, 1855.

2052. Josiah Gimson, of Welford-road, Leicester, engineer. An improved feed apparatus for steam boilers.

2054. George Stanley Hinchliff, of the firm of Hinchliff and Co., of Piccadilly, Westminster, paper hanging manufacturers. Improvements in the manufacture of paper hangings. A communication.

2056. François Honoré Lebaigue, of Little Titchfield-street, Middlesex, chocolate manufacturer. An improvement in the manufacture of chocolate.

Dated September 12, 1855.

2060. James Higgin, of Manchester, Lancaster, manufacturing chemist. Improvements in treating madder or preparations of madder, so as to obtain a colouring substance therefrom.

2064. John Guy Roger, of Trinity-street, Cardiff, signal lamp manufacturer. Improvements in ships' signal lanterns.

Dated September 13, 1855.

2068. Robert Booty Cousens, of Halliford-street, Islington, Middlesex, engineer. Improvements in machinery or apparatus for making casks.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2062. Joseph Partridge, of West Bromwich, Stafford, plumber, and John Kirkham, of the same place, engineer. Improvements in malt crushers. September 12, 1855.

2091. John Gray, of Princes-street, Dublin, Ireland, medical doctor. An improved water-closet arrangement. September 17, 1855.

2100. Auguste Edouard Loradoux Bellford, of Essex-street, London. Certain improvements in fountain lamps. A communication. September 17, 1855.

[redacted]

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September 25th,* 1855.)

1069. Frederick George Sanders. Improvements in brick, pipe, and tile machines.

1082. John Higgins. Improvements in steam-boilers and apparatus connected therewith.

1084. James Pettigrue. Improvements in propelling vessels.

1093. Levi Lewis Hill. Improvements in silvering glass.

1096. Peter Christie. An improved tent or hut for soldiers in the field, emigrants, tourists, and other persons requiring a portable dwelling.

1101. Wilfrid Latham. Improvements in cutting the terry or pile of certain textile fabrics used for saddle-covers.

1108. Robert Vezey and Edmund Vezey. Certain improvements in carriage-steps.

1111. Robert Murdoch. Improvements in agricultural apparatus for sowing seeds, and for depositing manure.

1115. Jean Guillaume Butt and Jean Alfred Martin. A new system of rotary steam-engines.

1118. James Rae. Improvements in warming railway passenger carriages and compartments in steam-vessels.

1119. William Smith. A new machine for cleaning cotton and other fibrous materials. A communication from M. Edmond Neven, of Malaunay, France.

1125. William Henry Dearing Granville. Improvements in fire-arms and cartridges for the same.

1139. Ignace Joseph Silbermann, junior. Improvements in printing on any kind of surfaces.

1154. Homer Holland. Improvements in the method of treating metalliferous sulphurets.

1180. George Horrocks. Certain improvements in shuttles.

1200. Auguste Edouard Loradoux Bellford. Improved machinery for making envelopes. A communication.

1201. Auguste Edouard Loradoux Bellford. A new apparatus for regulating the speed of steam-engines. A communication.

1202. Théodore Marie Rabatté and Jacques Rettig. Improved machinery for bruising, graining, or currying leather, skins, and hides.

1231. William Arthur Henry. Improvements in vices, and in the mode of securing the same to work benches.

1247. Antoine Bernard Alfred Baron Espiard de Colonge. An improved diving apparatus.

1287. Alexander Morton and Edmund Hunt. Improvements in motive-power engines.

1325. William Kemble Hall. Improvements in breaks for railway-carriages.

1361. Felix Leloup. Certain improvements in treating textile fabrics or substances, for separating cotton or other vegetable substances from wool, silk, and other animal products. A communication.

1468. Denis Daniel Buhler. Certain improvements in the construction of fencings.

1593. Jean Baptiste Pascal. Certain improvements in obtaining motive power.

1708. John Aaron Benfield. Improvements in propelling vessels.

1714. George Woods. Improvements in pack-saddles.

1861. Charles Rowley. Improvements in elastic bands.

1865. William Hudson. Certain improvements in the construction of stop-rods or protectors in power-looms for weaving.

1867. William Emerson Baker. Improvements in sewing-machines. A communication.

1875. Robert Crawford. Improvements in ornamental weaving by Jacquard looms.

1885. Henry Knighten. An improved construction of portable drill.

1913. Thomas Bartlett. Improvements in machinery for drilling or boring into stone.

1954. Charles Radcliffe. A machine or apparatus for moistening or "damping" woollen or other textile fabrics for finishing.

1970. James White. Improved machinery for cutting soap into slabs, bars, and cakes. A communication.

1976. Alexander Isaac Austen. An improvement in the manufacture of candles and night-lights.

2028. Louis Dameron. Improvements in the construction of carriages.

2034. Henri Boucherie. Certain improvements in machinery for impregnating woods with chemical materials for their preservation and coloration.

2091. John Gray. An improved water-closet arrangement.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed September 22, 1855.

645. Frederick Ransome.
650. Robert Joseph Jesty

Sealed September 25, 1855.

663. John M'Kinnell.
667. Henry Charles Hill.
674. John Cooke Bourne.
675. John Gedge.
682. John Shae Perring.
684. François Ettienne Hudde and Jean Baptiste Emmanuel Fouquet.
685. William Hutchison.
694. John Gedge.
699. Alexander M'Dougall.
708. William Swain.
710. George H. Babcock and Ascher M. Babcock.
719. John Bailey Surgey.
720. William Corbitt.
721. Robert Hardman.
725. Thomas Russell Crampton.
740. Thomas Prideaux.
751. Samuel Greenwood.
755. Louis Ambroise Michel Mouchel.
759. James Chesterman.
770. Alexander Rollason.
791. Lord Charles Beauclerk.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Aug. 31	3748	J. Eddy	Exeter	Plough.
Sept. 3	3749	Goodall and Son, and Mould and Tod	Camden-town	Powder Envelope.
,,	3750	Dent, Allcroft, and Co.	Wood-street	Tilbury Glove.
,,	3751	T. Binns and G. Binns	Huddersfield	Expanding Envelope.
6	3752	J. Parkes	Birmingham	Dress Fastener.
,,	3753	Hume and Melville	Edinburgh	Embossing Stamp.
10	3754	J. Eagles and Son	Walsall	Brush.
11	3755	S. Hemming	Bow	Fireproof Building.
14	3756	Tucker and Son	Strand	Cooking Lamp.
18	3757	H. Bird	Stourbridge	Mouthpiece for Cornopeans.
,,	3758	Donaldson, Hirsch, & Spark	Goswell road	Shirt.
19	3759	H. B. Peacock and Son	Manchester	Carriage Mantle.
20	3760	E. R. and T. Turner	Ipswich	Mill Frame.
25	3761	R. Linneker	Derby	Smoke Consuming Furnace.

PROVISIONAL REGISTRATIONS.

Aug. 29	688	J. H. G. Wells	Tottenham-court-road	Lamp-Oil Indicator.
Sept. 5	689	T. Pope	City-road	Flower-Pot.
10	690	G. Kane	Dublin	Hinge Joint.
12	691	W. H. Bentley	Bedford	Liquid Heating Apparatus.
,,	692	W. B. Edridge	Fulham road	Office Paper Binder.
,,	693	H. L. Burton	New-road	Carriage Break.
17	694	R. J. Lawrence and J. Allday	Birmingham	Locket Stereoscope.
20	695	J. Boucher	Chancery-lane	Bullet.
,,	696	J. Callingham and B. Fillmer.	Preston Kent	Water Wheel.
24	697	W. D. Gray	Old Kent-road	Indicator.
25	698	M. Smith	Poland-street	Paletôt Mantle.
,,	699	E. Edwards	Birmingham	Insect Trap.

CONTENTS OF THIS NUMBER.

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Mechanics' Magazine.

No. 1678.] SATURDAY, OCTOBER 6, 1855. [PRICE 3D.

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PIDCOCK'S PATENT "HIRUDINE" PROPELLING AND STEERING APPARATUS, FURNACE BLAST, &c.

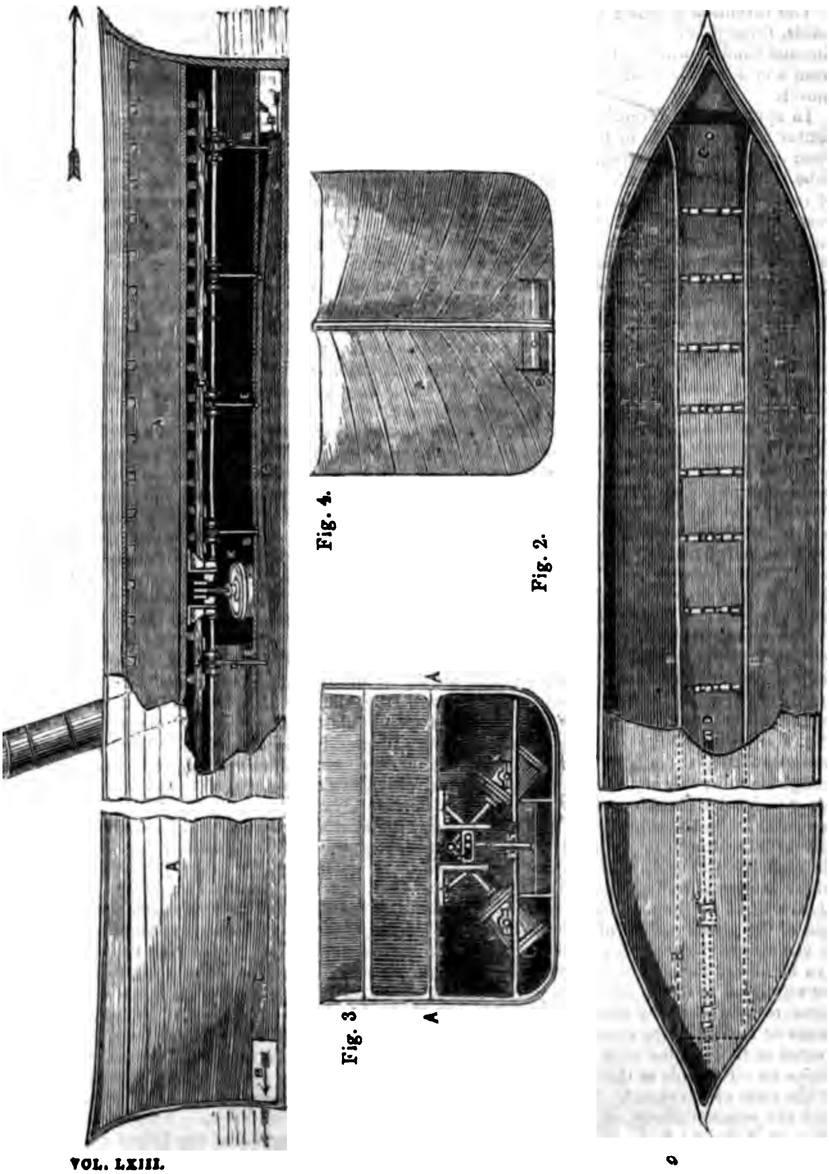


Fig. 4.

Fig. 2.

Fig. 3

PIDCOCK'S PATENT "HIRUDINE" PROPELLING AND STEERING APPARATUS, FURNACE BLAST, &c.

(Patent dated February 21, 1855.)

MR. J. H. PIDCOCK, of Leighton Buzzard, patented on the above day an apparatus for applying power, which is applicable to the propulsion and steerage of ships, the production of furnace blasts, the working of pumps, &c. The new arrangement has been named the "Hirudine," (from *Hirudo*, the leech) in consequence of its action resembling that of a leech in motion.

The invention consists in acting upon water or other liquid, or upon gases and other fluids, through an undulating elastic band, or series of strips, united so as to form a continuous band to which an alternating up and down undulatory motion is communicated from a cranked shaft or other source, set in motion by a steam engine or other prime mover.

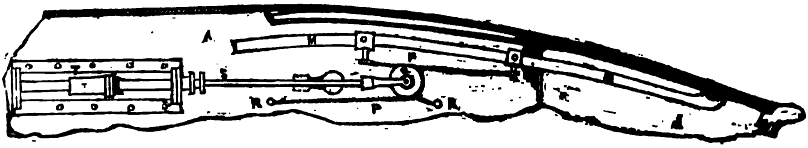
In applying the invention to the propulsion of vessels, according to one method, the inventor forms a trough or tube under the water line of the vessel, parallel to the keel, and open at the stem and stern. He fits a jointed band in an undulating line in this trough or tube along nearly the whole length thereof, and causes it to move up and down, by means of rods working through the upper part of the trough or tube, and connected to cranks or eccentrics upon a shaft running through the length of the vessel. At each stroke of the engine the whole contents of the trough or tube will be twice ejected therefrom, and the vessel will be caused to move ahead or astern at pleasure. In order to steer the vessel, by giving different directions to the water entering into and issuing from the trough or tube, he fits vanes, paddles, or sluices at each end of the trough or tube. By properly adjusting these vanes in a vessel, so as to cause the water to enter at one side of the trough or tube and to issue from the same side at the opposite end of it, a vessel could be turned round in her own length, or nearly so. In fact, by the admission and ejection of the water being properly adjusted, the greatest nicety in steering may be readily and with certainty attained, and the vessel even made to move sideways.

Fig. 1 of the engravings annexed is a side elevation, partly in section, of a vessel having the "Hirudine" propelling arrangement applied to her; fig. 2 is a plan of the same, also partly in section; and figs. 3 and 4 are respectively a cross section and a front view. A A is the hull of the vessel; B is the trough or tube, which is under the water line, parallel to the keel, and open at stem and stern, as before mentioned; C C is the jointed band, which is fitted in the trough or tube, B, so as to be in close contact with the sides thereof; and D D are rods by which the jointed band is caused to receive an upward and downward undulatory movement. E E are stuffing boxes in the upper part of the trough or tube, B, through which the rods, D D, work; F is the engine crank shaft; and G G are cranks to which the rods, D D, are connected, the crank pins of the cranks, G G, working in slots, H, formed in the cross heads, I, attached to the rods, D D, as shown in fig. 3. J J are guides, between which the cross heads, I, work, so as to keep the rods, D D, steady during their upward and downward motion; K K are a pair of oscillating cylinders, by which the crank shaft, F, is set in motion, and the rods, D D, thereby acted on so as to produce in the jointed band, B, the upward and downward undulatory movement before mentioned. Fig. 5 is a plan of the steering arrangement as adapted to one side of the vessel, it being understood that there is to be a similar arrangement on both sides and at both ends of the trough or tube. L is a vane, paddle, or sluice, which works in a space formed between the inner and outer planking of the vessel, and is capable of being moved forward so as to come in contact with the stern posts, and thus prevent the admission of water at one side of that end of the trough or tube; M is a rod attached to the vane or sluice, L, and working through a stuffing box, N; O O are shackles fixed on the rod, M; and P P are chains which are connected at one end to the shackles, O O, and after passing round the pulley, Q, are fixed at their opposite ends to ring bolts, R R. The pulley, Q, is attached to the end of the piston rod, S, of a water or steam cylinder, T, so that, by the admission of water or steam into that cylinder to act on the piston thereof and its rod, S, the vane or sluice, L, can be moved forward or backward, and the admission of water into the trough or tube can be regulated accordingly. The piston rod, S, may also be connected with suitable apparatus to be worked by hand for the purpose of steering the vessel when under sail. The vanes or sluices at the stern of the vessel are fitted in a similar manner, and may be connected to those at the stem of the vessel, so as to be acted on simultaneously, each vane or sluice on either side at the stern being connected to the vane or sluice on the opposite side at the stem of the vessel. By this arrangement the steering of the vessel can be performed *with the greatest nicety*, as before mentioned.

The "Hirudine Propeller" is not, however, the only application of the invention, from

which great results are anticipated, but it is held to be also of the highest importance to ironmasters, founders, glass-manufacturers, and all who make use of the blast furnace. "The Hirudine," says the *Mining Journal* of Saturday last, "is an appliance that affords a happy solution of the long-felt difficulty of economically securing a blasting power to fulfil all the various requirements of furnace operations. While on the one hand it is as inex-

Fig. 5.



pensive for working as the fan, and even more commodious in arrangement, it possesses, on the other, an action as potent and complete as that of the far more costly cylinder. The construction of the Hirudine is essentially simple and durable." For the furnace blast, it may be fixed beneath the ground, or under the floor line of the works, so that the apparatus will occupy the least possible space. A tolerably rapid movement of the undulating band will convey a strong and unintermitting draught of air to the furnace, and with far fewer revolutions, and consequent wear of machinery, than with either the fan or cylinder. For mining drainage, mill, and other purposes demanding great pumping power, the Hirudine is stated to afford considerable facilities, the mechanism of the pump being precisely similar to that of the furnace blast or the ship propeller. At each revolution of the shaft the whole column of water in the tube, whatever its length, is twice forcibly discharged; and thus with some 12 or 15 revolutions per minute, a continuous body of water is ejected at a rate of from 50 to 60 miles per hour, though the machinery only moves at from 100 to 200 feet in the minute; and thus the inventor alleges that the largest amount of work is accomplished with the least possible amount of strain, friction, or vibration.

BONELLI'S TELEGRAPHIC SIGNALS FOR RAILWAYS.

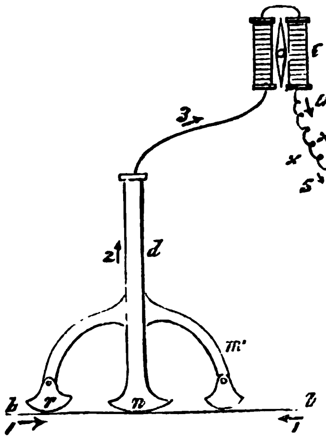
(Patent dated January 25, 1855.)

Chevalier Gaetano Bonelli, of Turin, Director-General of Sardinian Telegraphs, patented in this country, on the above day, a peculiar construction and arrangement of electric telegraphic apparatus, and a method of applying the same, so as to enable one or more trains or engines, whether in motion or stationary, to correspond either with each other, or with a telegraph station, or with the policemen, pointsmen, or other officials on the line. In carrying out this invention, an insulated conductor is used, which may be placed longitudinally between the two rails of the up and down lines, and upon this conductor is made to slide or run a piece of metal or anti-friction pulley, attached to the engine, tender, or waggon, as the case may be, and communicating with an electric telegraph apparatus placed thereon. This apparatus communicates in its turn with the earth through the wheels of the locomotive and the rails of the line, or by a separate piece of metal sliding on the rails. A circuit is thus formed by the insulated conductor, the telegraphic apparatus on the locomotive or carriage and the earth. The locomotive or carriage is provided with a small battery, the current from which passes along the before-mentioned circuit by suitable connections, as in the ordinary telegraphs. The telegraphic apparatus may be of any of the well-known arrangements, and the arrangement of the insulated conductor may be varied according to circumstances, such, for example, as a change of line or a level crossing. The insulated conductor may either be placed in communication at its extremities with a telegraph station, thereby affording facility for corresponding with locomotives on the line, or the ends of the conductor may be simply bent down into the earth. Conductors so laid down may be substituted for the present mode of carrying telegraphic wires, being, according to the inventor's statements, less expensive than the plan at present adopted. As each engine or train on the line will be furnished with complete apparatus necessary for sending or receiving messages, it is obvious that one engine or train may readily correspond with the next train, either before or behind, and learn thereby not only the locality of such train, but make known in return the precise locality in which it is itself situated. In

cases of obstruction on the line, by laying a bar of iron or other conductor across the rails in front of the obstruction, and in such a manner as to be in contact with the conductor and one of the rails, a constant current will be sent through the locomotives or trains, and the engine-drivers will know by the deflections of the needles that the line is obstructed, and that, consequently, a good look-out and great care will be required. An engine or train may also correspond with the telegraph station, and learn whether the line is clear at such station.

Along the line, *a*, *b*, in fig. 1 of the accompanying engravings, a bar of iron is laid, along which slides a piece of metal *d*, suspended to the locomotive, which piece of metal is in communication with the coil *e*,

Fig. 1.



forming a part of the one-needle telegraphic apparatus of Wheatstone and Cooke, or other suitable arrangement, the dial-plate and working handle of which are under the eye of the attendant. A wire, *c*, forms a communication with the earth, either by means of the wheels of the locomotive, or by a piece of metal sliding along the rails. Whether the locomotive be in motion or not, if a current of electricity arrives from *a* or *b*, it follows the route indicated by the arrows on the figure from 1 to 5, and produces a deviation of the magnetic needle, when it is conveyed back again by the earth. Signals may in this manner be sent to the locomotive from stations situated either in front or behind it.

If the locomotive receiving the signals carries a battery, the circuit from which is interrupted at the point, *x*, by means of a commutator between the arrows 4 and 5 (the *wire being broken at this place*), it will be found very easy to signal to other locomotives or to stations along the line.

Fig. 2 of the engravings represents a longitudinal elevation of a portion of the line; on which are arranged, first, a telegraphic station; second, three locomotives

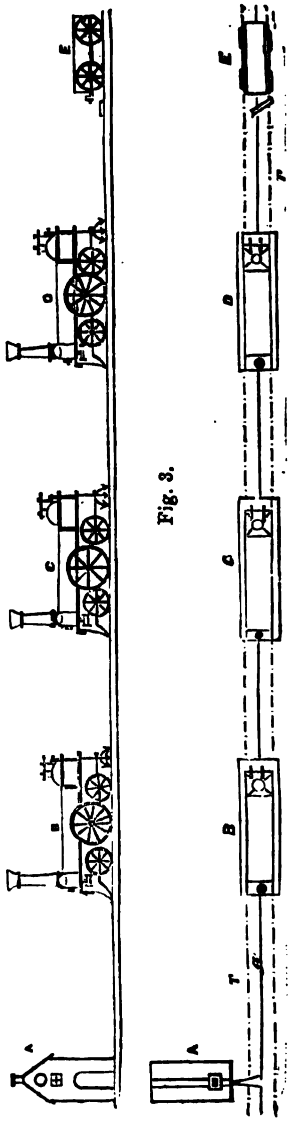


Fig. 2.

Fig. 3.

B, C, D, either in motion or at rest; and, third, a carriage E, left by accident on the line. Fig. 3 is a plan of this arrangement.

Between the rails, *r*, is fixed the insulated iron conductor, *a*, *b*, which rests upon supports, *f*, of earthenware or other non-conducting material fixed upon the transverse sleepers of the railway, as shown in the details, figs. 4 and 5. At fig. 8 is represented

Fig. 4.

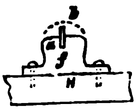
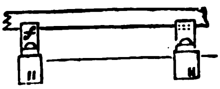


Fig. 5.



another description of earthenware support, which is fixed to the cross-pieces by means of a suitable screw-pin. It would be advisable, in order to insure perfect insulation, that all the faces of this bar, except that in communication with the locomotive, should be coated with some bituminous substance. At level crossings it is necessary to place this bar below the rails, in order to protect it from carts or carriages that may be passing over it. The patentee observes that this arrangement of conductor may be employed in ordinary telegraphs in place of the wires now in use, over which he considers it to possess the advantages of economy and safety. In this case the bar would be entirely covered with tar, and might be protected by a sort of cover, as shown in dotted lines in fig. 4. The ends of the bars which form the insulated conductor must of course be in perfect metallic contact; they are, therefore, united by means of screws, and it is found advisable to introduce at the joint a piece of sheet tin.

At places where the line changes or branch lines occur, the arrangement represented at fig. 6 is used; the bar, *a*, *b*, is in-

Fig. 6.

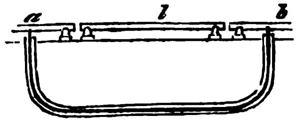
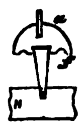


Fig. 8.



terrupted, or its continuity broken, and the communication between the two ends of the bar is effected by means of the rod, *k*, coated thickly with tar, and passing under ground. In passing along the conductor the slider encounters the bar, *l*, the object of which, however, is thereby to sustain it, this bar being quite independent of the conductors, *a*, *b*. The bar, *l*, is in connection with the points, and turns with them. By this arrangement the current of electricity is interrupted during the time that the slider passes over the bar, *l*, but this interruption is, however, of such short duration, that the inconvenience is immaterial.

For telegraphic stations the conductor, *a*, *b*, may be similarly interrupted, and the bar, *l*, placed in communication with the telegraphic apparatus, this bar being thus made a part of the circuit. It is proposed, however, to make use of currents derived from other sources, instead of making the principal current pass through all the spirals of the coils of the telegraphic apparatus, which would lessen its power. By this arrangement the signals sent from either stations or locomotives would be repeated at all the other stations along the line. It will be seen, in fact, that the current starting off from the first station must necessarily produce its effect on all the coils of the different apparatus along the line.

The entire current which starts from any particular apparatus encounters no other external resistance than that of the apparatus from which it starts, not a fraction of this resistance being altered by the number of other apparatus on the line. The resistance of the spiral of the station from which the message is sent may be easily avoided by the employment of a key or second conductor, which is introduced into the circuit at the moment of transmission only by the motion of the hands of the manipulator, and which receives a convenient quantity of the transmitted electricity. Although an insulated conducting bar of large section may be found very advantageous, as by this the resistance to the passage of the electricity is almost entirely obviated, yet it only allows of *derived* currents of electricity being used, which considerably lessens the necessary force of the batteries, instead of forcing the current to traverse all the spirals of the coils. This system will work, however, even if a diameter is given to the conducting bar equal to the diameter of one of the telegraphic wires in ordinary use; that is to say, if one of such wires be substituted for it. In this case, as the resistance of the conductor is no longer inconsiderable, the stations or locomotives can only correspond with a limited number of other stations or locomotives, that is to say, only with the nearest ones.

The slider, that is, the piece of metal suspended to the locomotive, establishes the communication between the conductor and the telegraph apparatus. This slider may be of various forms; that which is represented in fig. 8 is composed simply of a bar of iron of a rectangular section, *m*, terminated at the lower end by the curved and grooved piece, *n*, which rests upon the insulated conductor.

The bar, *m*, moves in an earthenware guide, *o*, fixed to the frame of the engine or

wagon, and it is furnished with an enlargement at its upper extremity, *p*, which limits its descent. The wire connected to the top of the slider is in communication with the telegraphic apparatus on the engine. The bar, *m*, which is of sufficient weight to keep it constantly pressed upon the conductor, carries two arms, *m'*, to which are jointed the sliding pieces, *r*, furnished with some suitable material for keeping the conducting-bar clean.

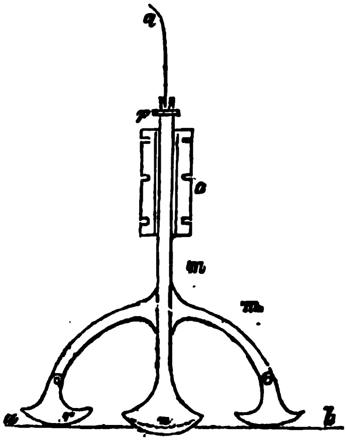
In order to remove the snow, a blade is fixed in place of the rubbers, which effectually remove any snow that may rest upon the bar. The piece, *n*, may also, if desirable, be replaced by a roller, and the pressure which it exerts may be increased by means of a spring.

In railways composed of two lines of rails, a single conductor may be used, placed between the two lines, instead of a separate conductor for each pair of rails: in this case the instruments at the stations will not require two needles. The slider must in this latter case be fixed at the side of the locomotive, and may be kept pressed against the side of the conductor by means of a bent lever and counterpoise weights, or by a spring, or any other suitable arrangement. In order that no ill effects may arise from the meeting of the trains, the sliders of the different trains press against two different sides of the conducting-bar. By this arrangement trains on different lines of rails may communicate with each other.

M. Bonelli considers that the communication with the earth may easily be effected by means of any good conducting material pressing against the axle of one of the pairs of wheels of the engine; by preference one of the driving wheels. If required, a piece of metal may be made to slide against the rails in place of passing the current through the wheels of the engine. In using this apparatus, supposing that the locomotive, B, is about to start from the station, A, the engineer commences by moving his manipulator handles, where, if there are no other locomotives on the line either before or behind him, and if the bar be properly insulated, no deviation in the needles will take place. The engineer is then satisfied that he can proceed in perfect safety. But generally there are locomotives on some part of the line, and in this case of course the needle would deviate; the engineer of the locomotive, C, however, would also perceive the deviation of his needle, and he would instantly reply, stating in what part of the line he was. The first would then know whether he could safely proceed or not.

The two engineers of the locomotives B and C may communicate with one another whether they are at rest or in motion, and the signals which they exchange will be understood by all the trains on the same line. If, in front of the station A, the conducting

Fig. 7.



bar be separated and the two ends be put in communication with the wires of the instrument at that station, thus allowing the current to circulate through it, signals may then be exchanged between the station and the trains which are near to it, which may thus ask for instructions, or for anything else that may be required. In the railways composed of two pairs of rails, each possessing a conducting bar of its own, it is necessary that an instrument of two needles should be used at the station, one needle for each conductor.

If for any reason it is necessary to abandon any carriages upon the line, approaching trains may be warned of their danger by simply placing a bar of iron in such a manner as to touch both the conducting bar and the rails. The engineer of the approaching train would perceive that his needle was deviating, although no answer could be obtained to his signals; he would then understand that an obstacle existed, and that it was necessary to proceed with caution. But for this purpose it would be necessary that the extremities of the conducting bar should be insulated instead of entering the earth. The force with which the needle deviated would enable the engineer to calculate roughly the proximity of the obstacle. If it is required to communicate simultaneously with two trains on different lines, it is simply necessary to put the extremities of the conducting bars of the two lines into communication, and to proceed as before.

An alarm may be placed on the locomo-

tives, in the same manner as in ordinary telegraphs. "Independently," says M. Bonelli, "of the great utility of this arrangement when applied to moving telegraph stations, that is to say, to locomotives, it possesses, in its application to ordinary telegraphs, the following important advantages:—

"1st, Its slight elevation above the ground and the simplicity of its supports.

"2nd, The section of the conducting bar being larger than that of the telegraph wires in ordinary use, the resistance offered to the passage of the electricity is very much reduced.

"3rd, The general arrangements of the telegraph stations in which each instrument communicates with the earth, and is actuated by a special derived current instead of a direct current.

"4th, The facility with which it may be attended to and repaired.

"5th, The economy in the batteries, since messages to be transmitted through great distances require no more power than those for small distances.

"6th, The extreme facility with which, by this system of derived currents, communications may be effected with any number of stations.

"7th, The insulated action of each instrument, by which it is not necessary, as in the existing system, for intervening stations to interrupt communications.

"8th, The possibility, in its application to railways, of considerably reducing the number of fixed telegraphic stations, which, according to this system, would be simply placed at stations of importance."

THE MONSTER STEAM SHIP.

From a report just adopted by a meeting of the Eastern Steam Navigation Company, respecting the progress of the enormous steam ship in course of construction at Mr. J. Scott Russell's dockyard, it appears that she has been proceeded with rapidly during the past half year, and is expected to be finished in about one year from this time. The following is the report of Mr. Brunel, the engineer who is charged with the construction of the vessel:

I am happy to say that my anticipations at the period of the last annual general meeting have been realized, and that we have proceeded at a more rapid rate in the construction of the ship, and that this rate of progress is likely to be still further increased, at all events until the winter season and the very short days may interfere with us. The whole of the main body of the ship is in a forward state, and I hope within a fortnight from the present time, in compliance with instructions, to begin laying the decks of the centre compartment, and fitting up one division with cabins and other fittings, so as to afford a good practical means of trying and determining the most economical and the most efficient mode of fitting up the whole vessel. The designs of the screw and paddles have been finally determined upon and the work put in hand. The engines of both makers are in a forward state, and I expect soon to begin fixing some of the boilers in place, and the sleepers and framing are now being prepared in the ship to receive the engines. The general design of the masts and rigging which has been thought most fitting for such a vessel has also been finally determined upon, and after the model has been made, which has been ordered, and the whole well considered and settled in detail, we shall be ready to enter into contracts for the execution of this part of the work. The works necessary for the launching of the ship will shortly be commenced. After more than a year's consideration the plan originally determined upon appears in every respect to promise the most satisfactory result. I referred to it in detail in my last half-yearly report. On the occasion I mentioned one or two cases in which a somewhat similar mode of launching had been adopted in England, but certainly not for large steamers. The publication of that report has afforded a gratifying proof of the interest which is taken in this work in America and the disposition in that quarter to afford every assistance, as, within a few weeks of the circulation of my report, and as quickly as the post could return any notice of it, I received communications from Buffalo, in the United States, encouraging me in adopting that mode of launching as the one already adopted, and proved in practice to be the best for the large steamers built in that neighbourhood, and giving me details as to the mode of proceeding and the precautions used. I am anxious to take this occasion of expressing my thanks to my correspondent, Mr. Bull, and of acknowledging the American claim to priority. Such being the forward state of the works, I think it would be very desirable that no time should be lost in seeking for men competent to undertake the command of such a ship, and probably also for engineers, to whom these, the largest engines yet made, are to be entrusted. In the commander of such a ship we want not merely a good seaman, but a man capable of apprehending and appreciating the new and peculiar powers which such a machine will place at his disposal; and he must be one who, while he will bring his

seamanship and his experience into aid, must be prepared and must be able to apply his mind to the consideration of the best means of working that which may be considered rather as a new and powerful machine than merely as a ship. The public announcement of the directors being prepared to consider this subject will, no doubt, lead to communications from some of the many able men, who, I trust and believe, would not be otherwise than ambitious to take the lead in what may be considered almost a new system of navigation.

EXPERIMENTAL OBSERVATIONS ON AN ELECTRIC CABLE.

BY MR. WILDMAN WHITEHOUSE.*

After referring to the rapid progress in submarine telegraphy which the last four years have witnessed, Mr. Whitehouse said, that he regarded it as an established fact, that the nautical and engineering difficulties which at first existed had been already overcome, and that the experience gained in submerging the shorter lengths had enabled the projectors to provide for all contingencies affecting the greater. With this view, a glance at our insular position on the map of the world, at the distance which separates us from our colonies and dependencies, as well as from the vast continents of India and Australia, awakens at once in the mind the inquiry,—"Are these remote families of the earth (or rather parts of our own family) accessible by telegraph? Or, are they to be for ever denied the advantages which we enjoy?" The world is ready, and society is eager, for its unlimited extension. Public interest is awakened; nations are stirring; and in America, as in England, capitalists are not wanting who are ready to aid in the stupendous work of an Indian or a Transatlantic line. They wait only for an answer to the question—Can it be proved to be practicable, commercially practicable, and capable of working at such a speed as will admit of messages being sent at a low tariff? The author then drew the attention of the section to a series of experimental observations which he had recently made upon the Mediterranean and Newfoundland cables, before they sailed for their respective destinations. These cables contained an aggregate of 1,125 miles of insulated electric wire, and the experiments were conducted chiefly with reference to the problem of the practicability of establishing electric communications with India, Australia, and America. The results of all the experiments were recorded by a steel style upon electro-chemical paper by the action of the current itself, while the paper was at the same time divided into seconds and fractional parts of a second, by the use of a pendulum. This mode of operating admits of great delicacy in the determination of the results, as the seconds can afterwards be divided into hundredths by the use of a vernier, and the result read off with the same facility as a barometric observation. Enlarged fac-similes of the electric autographs, as the author calls them, were exhibited as diagrams, and the actual slips of electro-chemical paper were laid upon the table.

The well-known effects of induction upon the current were accurately displayed; and contrasted with these were other autographs showing the effect of forcibly discharging the wire, by giving it an adequate charge of the opposite electricity, in the mode proposed by the author. No less than eight currents — four positive and four negative —were in this way transmitted in a single second of time through the same length of wire (1,125 miles), through which a single current required a second and a half to discharge itself spontaneously upon the paper. Having stated the precautions adopted to guard against error in the observations, the details of the experiments were then concisely given, including those for "velocity," which showed a much higher rate attainable by the magneto-electric than by the voltaic current. The author then recapitulated the facts, to which he specially invited attention. First, the mode of testing velocity by the use of a voltaic current divided into two parts (a split current), one of which shall pass through a graduated resistance-tube of distilled water, and a few feet only of wire, while the other part shall be sent through the long circuit, both being made to record themselves by adjacent styles upon the same slip of electro-chemical paper. Second, the use of magneto-electric "twin currents," synchronous in their origin, but wholly distinct in their metallic circuits, for the same purpose, whether they be made to record themselves direct upon the paper, or to actuate relays or receiving instruments which shall give contacts for a local printing battery. Third, the effects of induction, retardation of the current, and charging of the wire, as shown autographically; and, contrasted with this—Fourth, the rapid and forcible discharging of the wire by the use of an opposite current; and hence—Fifth, the use of this as a means of maintaining, or restoring at pleasure, the electric equilibrium of the wire. Sixth, absolute neutralization of currents by too rapid reversal. Seventh, comparison of working speed at-

* *British Association.* 1856.

[redacted]

tainable in a given length of wire by the use of repetitions of similar voltaic currents, as contrasted with alternating magneto-electric currents, and which, at the lowest estimate, seemed to be seven or eight to one in favour of the latter. Eighth, proof of the co-existence of several waves of electric force of opposite character in a wire of given length, of which each respectively will arrive at its destination without interference. Ninth, the velocity, or rather amount of retardation, greatly influenced by the energy of the current employed; other conditions remaining the same. Tenth, no adequate advantages obtained in a 300 mile length by doubling or trebling the mass of conducting metals. The author, in conclusion, stated his conviction that it appeared from these experiments, as well as from trials which he had made with an instrument of the simplest form, actuated by magneto-electric currents, that the working speed attainable in a submarine wire of 1,125 miles was ample for commercial success. And may we not, he added, fairly conclude also that India, Australia, and America, are accessible by telegraph, without the use of wires larger than those commonly employed in submarine cables?

ON THE AURORA BOREALIS.

BY ADMIRAL SIR J. ROSS.*

THE communication I had the honour of making to the British Association for the Advancement of Science at Belfast, on the interesting subject of the aurora borealis, was verbal, and, therefore, not entitled to a notice in the Association's valuable *Transactions* of that period; but, having subsequently repeated the experiments I then verbally mentioned, I can now confidently lay the account of them before the public, trusting that, when taken into consideration, they will be found corroborative of the theory which I published in the year 1819, and which led to a controversy that shall be hereafter mentioned. It having occurred to me that, if my theory was true, namely, "that the phenomena of the aurora borealis were occasioned by the action of the sun, when below the pole, on the surrounding masses of coloured ice, by its rays being reflected from the points of incidence to clouds above the pole which were before invisible," the phenomena might be artificially produced; to accomplish this, I placed a powerful lamp to represent the sun, having a lens, at the vocal distance of which I placed a rectified terrestrial globe, on which bruised glass, of the various colours we have seen in Baffin's Bay, was placed, to represent the coloured icebergs we had seen in that locality, while the space between Greenland and Spitzbergen was left blank, to represent the sea. To represent the clouds above the pole, which were to receive the refracted rays, I applied a hot iron to a sponge; and, by giving the globe a regular diurnal motion, I produced the phenomena vulgarly called "The Merry Dancers," and every other appearance, exactly as seen in the natural sky, while it disappeared as the globe turned, as being the part representing the sea to the points of incidence. In corroboration of my theory, I have to remark that, during my last voyage to the Arctic regions (1850-1), we never, among the numerous icebergs, saw any that were coloured, but all were a yellowish white; and, during the following winter, the aurora was exactly the same colour; and, when that part of the globe was covered with bruised glass of that colour, the phenomena produced in my experiment was the same, as was, also, the Aurora Australis, in the Antarctic regions, where no coloured icebergs were ever seen. The controversy to which I have alluded was between the celebrated Professor Schumacher, of Altona, who supported my theory, and the no less distinguished M. Arago, who, having opposed it, sent M. G. Martins and another to Hammerfest on purpose to observe the aurora, and decide the question. I saw them at Stockholm on their return, when they told me their observations tended to confirm my theory; but their report being unfavourable to the expectations of M. Arago, it was never published; neither was the correspondence between the two Professors, owing to the lamented death of Professor Schumacher. I regret that it is out of my power to exhibit the experiments I have described, owing to the peculiar manner in which the room must be darkened, even if I had the necessary apparatus with me; but it is an experiment so simple that it can easily be accomplished by any person interested in the beautiful phenomena of the aurora borealis.

* British Association. 1855.

ON THE POLAR DECOMPOSITION OF WATER BY FRICTIONAL AND ATMOSPHERIC ELECTRICITY.

BY PROFESSOR ANDREWS.*

THE author having drawn attention to the fact, that water had never been decomposed by the action of the common friction electricity, so as to collect the gases and exhibit them at the opposite poles, stated that the cause of the failure of the experiment was the solution of the gases in the mass of the liquid. By fusing platina wires

* British Association, 1855.

in thermometer tubes, this difficulty is avoided, and the gases may be then obtained and collected with the same facility as in ordinary eudiometric experiments. By arranging a series of such tubes, the operations may be almost indefinitely repeated. On raising an electrical kite, the author succeeded in obtaining the polar decomposition of water by atmospheric electricity. The observations were made in fine weather, when the atmosphere was not usually charged with electricity. Although the gases were easily collected and measured, from the delicate form of apparatus employed, the quantity of water decomposed in this case amounted only to one 700,000th of a grain in the hour.

ATMOSPHERIC ELECTRICITY: THE DETECTION AND MEASUREMENT OF IT BY THE PHOTO-BAROGRAPH AND THERMOGRAPH.*

BY MR. M. J. JOHNSON.

Photography has already rendered very considerable aid to science, and some results brought before the section by Mr. Johnson, *Ratcliffe Observer*, Oxford, furnish an example of this. On examining and comparing the registrations of the thermometer and barometer, certain peculiarities presented themselves, which indicate a curious connection between the course of these instruments and the state of the weather. The line which indicates this course is sometimes serrated, sometimes even and continuous; and these appearances correspond to certain determinate states of the weather. The most remarkable result is a sudden change of the height of the barometric column, which takes place simultaneously with the occurrence of a peal of thunder:—a contemporaneous effect was produced upon the thermometer. It is to be hoped that Mr. Johnson will continue his observations, so as to place the connection, which he seems to have detected, beyond all doubt.

ON ALLOYS OF IRON AND ALUMINIUM.†

BY PROFESSOR CALVERT.

Messrs. Calvert and Johnson, of Manchester, have succeeded in preparing the following alloys of iron and potassium:—1st alloy: 4 equivalents of iron, 1 ditto of potassium. 2nd alloy: 6 equivalents of iron, 1 ditto of potassium. These alloys were prepared with the view of solving one of the great chemical and commercial questions of the day, namely, that of rendering iron less oxidable when exposed to a damp atmosphere; as these gentlemen believe that no kind of coating can be discovered which will resist the constant friction of water, as is the case with iron steamers. They have also succeeded in producing two new alloys, composed of iron combined with that most valuable and extraordinary metal lately obtained by M. St. Claire Daville. These two alloys are composed as follows:—1st, 1 equivalent of aluminium; 5 ditto of iron. 2nd, 2 equivalents of aluminium; 3 ditto of iron. The last alloy presents the useful property of not oxidizing when exposed to a damp atmosphere, although it contains 75 per cent. of iron.

* British Association. 1855. *Athenæum.*
† *Ibid.*

SPIRITS OF WINE FOR MANUFACTURING PURPOSES.

The excise order which permits the use of methylated spirits of wine for manufacturing purposes, free of duty, came into force on the first of this month. It would appear that this beneficial change in our commercial position owes its origin to the representations made by the Society of Arts to H.R.H. Prince Albert, who, impressed with the fact that the very high duty on spirits of wine placed an insuperable bar against all approach to fair competitive rivalry between this and other countries in many manufacturing processes, has successfully exerted himself to remove the impost. The regulations to be observed by consumers are now being issued gratuitously by Messrs. Lightly and Simon, the well-known wholesale wine and spirit merchants of Fenchurch-street, who have been licensed by the Commissioners of Inland Revenue to supply the spirit. The regulations are, of course, of an especial and stringent character, and it would be well if all persons desirous of availing themselves of the advantages offered by the new law, informed themselves of their nature.—*Globe.*

NEW THEORIES OF LIGHT AND HEAT.

To the Editor of the Mechanics' Magazine.

Sir,—I shall be glad if you can find space for the following paper in your Magazine.

I am, Sir, yours, &c.,
G. Fellows Harrington.

Having been a student and careful observer of nature for many years, I feel fully

satisfied the received theories on light and heat are incorrect, particularly those according to which light and heat are supposed to be transmitted from one heavenly body to another; and in the following communication I shall state several facts, which are inconsistent with the received opinions thereon, and endeavour to advance new theories, which I believe will be found perfectly to accord with all the phenomena which light and heat present in nature.

If we carefully examine what are called solar, lunar, and stellar lights, we shall find they exist in their greatest intensity near the earth's surface, where they are really wanted, and gradually decrease according to a geometrical ratio as we ascend through the atmosphere. And the same with the heat contained in what is called solar light. This is proved to be the case by those persons who have ascended high mountains, or in balloons; they tell us that the higher they ascend the less light and heat they have about them, and at great heights it is not only intensely cold, but the canopy of heaven above them wears a dark and gloomy appearance. This would appear to indicate that all the lights and heat above alluded to do not exist above the earth's atmosphere, although they appear to come from the sun, moon, and stars to our earth, and according to the received theories they do so: but if such theories are opposed by several well-established facts, they must give way to others more in accordance with truth, and in the course of time become obsolete, from a cause similar to that by which the theory which was formerly entertained about the sun, moon, and stars travelling round the earth, has passed away. I shall now proceed to proofs, and commence by endeavouring to show that light does not come from the sun.

1. The sun, as the centre of the solar system, has been compared to a candle or lamp, and it is said to give light to the planets which surround it in a way similar to that in which a candle gives light to objects in a room. At first sight such a comparison would appear to be correct; but let us examine it closely. If a candle be placed in a room, the light from it fills the room; and if we place an object between our eyes, and the candle so as just to hide its flame from our sight, we nevertheless see light issuing from the candle in all directions; and we are quite sure it is burning, although we cannot see it. And so with the sun: if we place an object in our atmosphere between our eyes and the sun, so as just to hide the disc of the sun from our view, we see what is called sunshine flowing down all round the object; but here the resemblance ends, for if the object of obstruction be placed above our atmosphere, between our eyes and the sun, as in the case of a total solar eclipse, no sooner is the disc of the sun just covered by the dark body of the moón than we cease to see any light whatever issuing from it; and Drs. Halley, Stuckley, and others who have witnessed such phenomena, say there is nothing in the heavens to mark the sun's position at such a time, and that its disappearance could not be more complete if it were annihilated. Now, as a total eclipse of the sun can only cause darkness over a circle of the earth 180 miles in diameter, it will be evident that if a spectator stood in the very centre, he could not be more than 90 miles from those parts of the earth which would be receiving light; consequently, if the light our earth receives really came from the sun, it would be seen flowing down all round the dark body of the moon, and the shadow caused thereby, and descending upon the earth as a mighty column of brilliant flame or light; but in reality no vestige of any light whatever is seen spreading out from the sun, or descending upon the earth, although nearly half of its surface continues to be clothed with light in the usual way; thereby proving, as I think, that the light the earth receives does not exist above the earth's atmosphere; also, that the sun does not give light to surrounding objects in the same way as a candle does, or else it would be seen spreading out to supply the planets; and that what we call solar light does not come from the sun to our earth, or it would be seen descending upon the earth under such circumstances.

It has been asserted that light would be invisible in a vacuum, and consequently it could not be seen spreading out from the sun and filling space to the extent of the solar system; also that the atmosphere round our earth is necessary to cause the light from the sun, &c., to become visible by refracting and reflecting it. I feel no hesitation in saying that these assertions cannot be supported by any direct evidence deduced from fair experiment, for where there is no light, or where light is invisible, there must necessarily be darkness, and although darkness is invisible by itself it instantly becomes apparent when contrasted with light. Now the upper part of the tube of a well made barometer is perfectly free from air, but such tube is as readily filled with visible light as a similar tube filled with atmospheric air, and under the same circumstances in other respects, no visible difference can be detected in them; whereas if light could not be visible without air, the exhausted tube ought to appear dark or black inside, like the dark empty space between worlds. It is the same with an ex-

hausted glass receiver over an air-pump; it becomes filled with light as readily as it would if full of air; indeed it is impossible to tell from the appearance whether the receiver is exhausted or not. Again, electricity will undergo combustion in a vacuum, and the flame itself, as well as the light given off from it, become as visible as they do in atmospheric air. Therefore, seeing there is no difference in the visibility of light, whether it exists in a vacuum or air, if the sun really gave off light as it is supposed to do, the space round our earth would be quite as brilliantly illumined with visible light as the earth's atmosphere is during the day; nay, more so, because it can be proved that the atmosphere absorbs light, and clouds often intercept a large portion of it, whereas space, being empty, could neither impede nor absorb it.

The truth of the position I am defending may be further illustrated if we admit a pencil of rays of what is called solar light into a dark room, by means of a small hole, for it will be distinctly seen in its passage across the room, and the contrast between such cord of light and the dark space in the room will appear very striking. Now if so small a portion of what is called solar light is thus clearly and distinctly visible in its passage through the dark space in the room, surely the immense column of the same material which is supposed to be flowing down on the earth round the dark body of the moon during the time of a total solar eclipse, would be visible under such circumstances; and as no trace of such light is seen, it is only fair to infer that it does not exist. Again, the dark shadow which would be produced by the earth intercepting light, if it really came from the sun, would form a striking contrast with surrounding illuminated space, which we should be able to see every night if it existed.

2. *The much-admired economy of nature is opposed to the opinion that the planets are supplied with light and heat from the sun.*

The economy observed throughout the whole system of nature has been the subject of admiration amongst scientific men for ages; they say, In nature nothing is wasted—everything is produced at the proper time and applied to an useful purpose—and that nothing has been created in vain. But if, according to the received theory, the sun throws off light and heat into space, at the rate of twelve millions of miles a minute in every direction, it will be evident that the planets could only intercept those few particular rays which travel in the direction of them, and these would form but a very small quantity compared with what would really be given off, and many, very many millions of times more light and heat would pass off into space and be apparently wasted than could possibly be intercepted and become useful to the few straggling planets in the solar system.

3. *Light, being material, cannot pass from the sun to the planets consistently with the well-established laws of gravitation.*

Heat can be proved to be a constituent principle of nature, and the agent of all chemical action; it always exists in connection with matter, and like matter it cannot be destroyed or annihilated, and is nowhere found to exist by itself, but whether it be in its latent, sensible, or luminous states, is only found to exist in connection with matter. Indeed I feel authorized by several experiments to say it cannot exist by itself; therefore as solar light, as it is called, contains latent heat, and is capable of producing chemical action, solar light must necessarily be material; and if this be admitted, I say material light cannot come from the sun to our earth consistently with the well-established laws of gravitation, because the sun attracts all its own matter towards its own centre, and it would be impossible that the slight force produced by the combustion which is necessarily going on over the surface of the sun, to produce the light which clothes him, can be sufficient, first to overcome the sun's power of gravitation, and then further act against that power with sufficient force to throw particles of matter in the form of light through hundreds of millions of miles of space at the rate of twelve millions of miles a minute; and even were it possible, which I deny, yet if such a process were really going on, the body of the sun must rapidly decrease in size, in order to supply the necessary materials for the combustion which would be required to fill the solar system with light and heat, and as a consequence the planets would recede from him through the lessened attraction, and the whole of the solar system would speedily be deranged; and, as Dr. Franklin says, particles of material light, however small they may be, yet coming from the sun to the earth at the rate of twelve millions of miles a minute, would acquire such a momentum that they would prove as destructive to things on our earth as twenty-four pounder shots discharged from a cannon.

4. *Heat cannot come from the sun to our earth consistently with the uniform temperature it has maintained for thousands of years.*

If I have a piece of red hot iron, and I wish to cool it, I can only do so by transmitting the heat it contains to some other body of matter. I may dip it in water, when the water will take the heat, and its temperature become raised thereby, or I may expose it to the atmosphere, when the air will

gradually take it and become rarefied thereby, or I may transfer it to some other body of matter, but I cannot in any way destroy or annihilate the heat I wish to get rid of. This being the case, and if heat cannot be destroyed, let me ask what becomes of the immense quantity of heat which the sun *is supposed* to be continually throwing upon the earth, enveloping one half of its entire surface, and varying in quantity up to 120°, seeing there is nothing to carry it away again? Why if such were really the case, even supposing the sun were to commence throwing heat upon the earth for the first time to-morrow morning, the heat thus thrown upon the earth would accumulate to such a degree, that in the course of a few months the body of the earth, by absorbing it, would become a white hot mass of fused material, and all animal and vegetable existence would speedily be destroyed, the sea would be dissipated in steam, and the atmosphere extended by every available description of matter being converted into gas. Therefore, seeing there is nothing to take the heat from the earth except its own atmosphere, and seeing its general temperature has never varied during thousands of years, it is impossible it can be receiving heat from the sun according to the received theory.

6. The late Sir William Herschel's opinion that the sun is a habitable globe is inconsistent with the received theory on heat.

According to Sir William Herschel's opinion, the sun is not a mass of fire, as was supposed by Sir Isaac Newton, and others up to his day, but a habitable globe similar to our earth only much larger; that the light which surrounds him is occasioned by luminosity in his atmosphere, and the dark spots visible on his surface, by high lands which rise above the most dense light, and, from being clothed with a less quantity, become visible by contrast. This opinion is received by philosophers in the present day. But it is also believed that the planets in the solar system derive light and heat from the sun according to the square of the distance they are from him: thus they say Mercury receives about seven times more light and heat than our earth, Venus about twice as much, and Herschel only one-three-hundred-and-sixtieth part the quantity. But it will be seen that these opinions are at variance, for if the planets receive light and heat from the sun according to the square of the distance they are from him, Mercury twice as much, Venus seven times as much, and so on, then if this calculation be carried up to the sun himself, it must be one white hot fused mass, many hundred times hotter than melted iron, as Sir Isaac Newton stated; in which case Sir William Herschel and his disciples must be wrong in supposing him to be a habitable globe; if, on the contrary, the sun is a habitable globe, then he cannot be the source of heat to the planetary system as at present believed.

Again, if the planets receive light and heat from the sun according to the square of the distance they are from him, not one of them can possess animal and vegetable existence such as we have on the earth, because the intense heat on those that are nearer the sun than we are, and the cold on others further from him, would prove equally fatal to any such existence.

Having raised the above objections to the received opinion, that the sun supplies the solar system with light and heat, I will endeavour to advance new theories to account for the production of all the light and heat our earth receives, which theories will be equally applicable to all the other heavenly bodies. I shall commence with heat. I believe heat to be a constituent principle in nature, that is, that it has a positive existence like matter itself, and, like matter, although its state of existence may be varied it cannot be destroyed or annihilated. This is proved by every experiment we make with heat, and the following four facts can also be proved in connection with it. 1st. Heat nowhere exists by itself; it cannot exist independent of, or disconnected from matter, neither can it be transmitted from one body of matter to another without a material conductor. 2nd. Heat exists in a latent state in all matter. By latent heat I mean heat which is so absorbed in matter that it is necessary to its state of existence, while, at the same time, it cannot be detected by the sense of touch, or by the aid of the thermometer. Latent heat regulates or controls the states in which matter exists, as the solid state of matter, the fluid state of matter, and the vaporous state of matter. Solid matter, as ice, always contains much less latent heat than the same description of matter, when in a fluid state, as water; and fluid matter, as water, always contains much less latent heat than the same description of matter in a vaporous state, as steam, or oxygen and hydrogen gases which, when liquified, form water. Therefore ice cannot be liquified into water without absorbing a large quantity of sensible heat, which heat becomes latent in the water, is necessary to its state as water, but cannot be detected by the thermometer. And water cannot be vaporized into steam or gas without absorbing a large quantity of sensible or free heat with which it must be supplied during the change which takes place, which heat then becomes latent or fixed in the steam or gas, in va-

cessarily confined to matter while in that state, and cannot be detected therein by means of the thermometer; and *vice versâ.* Matter in the state of steam or gas cannot be reduced to the liquid state as water, &c., without giving out and setting free the latent heat which was necessary to its state of existence as vapour, which heat then becomes sensible and affects the sensible temperature of other matter. And liquid matter, as water, &c., cannot be reduced to the solid state, as ice, &c., without parting with the latent heat which was necessary to its existence in the liquid state, which heat must also enter into and affect the sensible temperature of other matter. And so in the changes which take place in every description of matter, for matter contains less latent heat in its solid than in its fluid state, and in its fluid state it contains much less latent heat than in its vaporous state; indeed the state of matter is regulated by its capability to hold or contain latent heat. I have endeavoured to illustrate my meaning by matter which constitutes *water,* because I shall try to prove that it is principally by the changes which take place in it that the temperature over our earth is regulated. 3rd. Heat also exists in a sensible or free state. Sensible or free heat is heat not necessarily confined in any particular body of matter and held latent or fixed in it, but heat which exists in greater quantity than is necessary to the state of the matter with which it is associated, consequently it is free to remain in or leave the matter with which it exists. When sensible heat is supplied to matter in sufficient quantity to change it from the solid to the fluid, or from the fluid to the vaporous states, it instantly becomes latent in the matter the state of which it alters; in which case it no longer exists as sensible or free heat, but it becomes latent or fixed by being absorbed into the matter itself, and there it must remain until such matter is reduced, when the heat again becomes sensible; but so long as it remains connected with matter without being necessary to, or changing its state of, existence, it remains sensible and free to pass from one body of matter to another; and while in this state it is constantly in motion tending to produce an equal sensible temperature all over the surface of the earth. 4th. Heat in connection with matter also exists in a luminous state, but it more particularly manifests itself in this state while it is acting as an agent in reducing matter from its highest to a lower state of existence by what is called combustion, and while it exists with matter in this state it *constitutes light;* hence, all light is and *must be the result of combustion.* And as heat is a constituent principle in nature and indestructible, and as we have ample proof that the general temperature of the earth has not undergone a change for many centuries, it is only reasonable to infer that the earth contains and retains exactly the same quantity of heat as it received from the hands of the Creator, in precisely the same way as it contains the same quantity of matter as it received at the creation.

From what I have stated I wish it to be understood that the sensible temperature over our earth is raised by reducing the gases and aqueous vapour in our atmosphere to water, and also by reducing water to ice, because in both cases the latent heat which was necessary to their states as vapour, or water, becomes liberated as they are reduced, when it changes from the latent to the sensible state, and as sensible heat it is free to pass from one body of matter to another and raise the sensible temperature thereof.

The Rev. Edwin Sidney, M.A., in a lecture which he delivered at St. Martin's Hall, London, February 5th, 1855, made the following observation:—"Place in a shallow vessel a little water, under the receiver of an air-pump, and with it in another vessel, some sulphuric ether, or other rapidly evaporating fluid. Put the bulb of a thermometer in the water, and on exhausting the receiver, you will find that it will soon freeze. Now, observe the thermometer, and you will perceive that it will gradually go down to the freezing point, 32° Fahrenheit; but the instant the water becomes ice the thermometer immediately rises 8°." He further says "*I do not think it possible to give any satisfactory explanation of this phenomenon.*"

It is somewhat remarkable that I predicted such would be the case in a lecture which I delivered on this subject before the members of the "Portsmouth Philosophical Society," in March, 1853. It is true I did not say the thermometer would rise eight degrees, because I had never tried the exact quantity of latent heat that would be converted into sensible heat under such circumstance by experiment; but I said sensible heat must be generated, and the sensible temperature raised when vapour is reduced to water, or water to ice; and the experiment alluded to by Mr. Sidney confirms the truth of my prediction on two important points. First, it proves that as the sulphuric ether is formed into vapour, it requires and must obtain a large additional quantity of sensible or free heat, which heat becomes latent in the vapour as it forms, and, as the air is exhausted, or nearly so, from the receiver, the forming vapour cannot obtain the necessary quantity from the atmosphere;

[redacted]

because it is removed; consequently, it attracts sensible heat from the water until it reduces it to the freezing point, and the thermometer in connection therewith until it descends to 32°, when the water begins to freeze and lose its fluidity. And it proves, secondly, that the water cannot freeze without parting with the latent heat which was necessary to its state of fluidity, which heat, on being liberated from the water, becomes sensible or free heat, and, having little or no atmosphere to receive it, it passes to the mercury in the thermometer, and raises its sensible temperature 8°, thereby indicating that fluids generally cannot be reduced to solids without parting with the latent heat which was necessary to their state as fluids, which heat then becomes sensible, and free to associate itself with other matter.

I would here further state that, as the sensible temperature is raised by reducing vapour to water, or water to ice, so the sensible temperature is lowered by raising ice to water, or water to vapour. This may be further proved in the following way:—If you take a pound of boiling water, measuring 212° sensible heat, and a pound of ice measuring 32° of sensible heat, and mix the two together, you will find, after the ice is dissolved, the mixture will only measure about 32° of heat, the same as the ice itself measured, thereby showing that the whole of the sensible heat contained in the boiling water above 32° is necessary to liquify the ice when it becomes latent in the newly-formed water. Again, if steam measuring 212° be condensed in water measuring only 32°, it will speedily raise the water to the boiling point—that is, 212°, the same as the steam itself measured; thereby proving that steam cannot be condensed to water without liberating the latent heat it contained as steam, which heat then becomes sensible, and, associating itself with the water, raises its temperature until it boils.

Again, a person may be frozen to death, or a bottle of water may be frozen to a solid lump of ice in the hottest day of summer, by surrounding them with cloth saturated with ether; for, as the ether becomes converted into vapour, it requires a large supply of sensible heat which it attracts from the person, or water, or any other description of matter in its neighbourhood, and the process goes on, slow or fast, in proportion as the ether can obtain the necessary supply of sensible heat to vaporise. But, although an immense quantity of sensible heat is absorbed by vapour formed from ether, such heat cannot be detected in it, because it is held latent, and is necessary to the very existence of the vapour itself. And so it is with all vapour which the earth is continually giving to the atmosphere; it all requires sensible heat during its formation, and such heat necessarily becomes and remains latent in it until it is again reduced to the fluid or solid states, and then such heat must again become sensible and free to associate itself with other matter, and chemically affect it.

The views I am advocating may be further sustained and illustrated by several experiments; but I trust those I have alluded to will be sufficient to show that the earth contains less latent heat than the water which covers two-thirds of its surface, and that the water contains less latent heat than the gases, vapours, and effluvia which constitute the atmosphere, and entirely surround it. And that, therefore, the atmosphere is the grand receptacle of the latent heat so necessary to support combustion and other chemical changes which are going on therein to clothe the surface of the earth with light, warmth, &c. But, before leaving this part of my subject, I wish it to be most distinctly understood that latent heat is *always* confined in matter, and is necessary to either of the states in which matter exists; that sensible heat is heat more than sufficient for the state of matter as it exists, and is free to pass from one body of matter to another; that sensible heat is the parent of all chemical action, whether it exerts its powers to raise or reduce matter from one state to another, or change the nature and properties of matter in other respects; and that luminous heat is heat which only manifests itself in matter while it is in a state of combustion.

(*To be continued.*)

THE PROJECTILE CONTROVERSY.

To the Editor of the Mechanics' Magazine.

Sir,—It appears to me that the point on which the whole of the present projectile controversy turns is this—while one party argues on the hypothesis of the first law of motion as expounded by Newton, the other denies the truth of that law, and asserts that any force whatever being applied to a mass of dead matter, such force will gradually vanish from it, and the mass will come to rest. In order to reconcile this theory with the observed permanence of the orbits of the planetary bodies, they are compelled to furnish those bodies with a principle they call *vis viva*.

Now, granting this hypothesis, it is evident that as in the course of the daily rotation and yearly revolution of the earth (the point from which every human being is compelled to take his experience) is itself, though relatively to him fixed, actually and constantly moving with immense velocity,

and continually altering its motion in every possible direction that can be compounded of the two motions of the earth, it follows that any experience, showing that bodies acted upon by any impulse relatively to him come to rest, proves *not* that they come actually to rest, but tend constantly to return to that motion which they, in company with the observer, had before the impulse was applied. Therefore the same experience which shows that bodies have a tendency to come to rest, shows that bodies have a tendency to preserve their original motion, which is absurd.

The hypothesis, therefore, contradicts itself, and is untrue; and the same can be shown of any other hypothesis than this, that no inert body has any tendency to alter its condition, be that condition either rest or motion.

In order to render their hypothesis rational, they will either have to endue all bodies with which they make experiments with the principle of *vis viva*, or, on the other hand, take up the assumption that the earth is the centre of the universe, and actually at rest; and as to subject a body to the principle of evanescent impulses, and then to supply its loss of motion by a force acting within itself, is neither more nor less than Newton's first law explained in a somewhat peculiar manner, they will, if they allow it, have to submit implicitly to the projectile theories that mathematicians teach. The other alternative, I think, they will not fall back upon.

I am, Sir, yours, &c.,
I. M. E.

Sale, Cheshire, Oct. 1, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—Your correspondent "W.," in your No. 1676, states: "We have an elaborate system, *founded on the first law of motion*, which admirably and accurately accords with the observed facts of cases of motion almost innumerable."

I shall feel extremely obliged to "W." if he will favour us with only one case in which the assumed first law of motion is demonstrated and found in accordance with the observed facts. I presume "W." is well aware that the mere fact of seeing a body at a distance moving is not sufficient to prove that such a body moves without the aid of a propelling force. The calculations to determine the positions of the celestial bodies in their orbits at any given time have nothing to do with the power that causes such movements to continue.

I am, Sir, yours, &c.,
EVAN HOPKINS.

38, Thurloe-square, Brompton, London.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BULLOUGH, JAMES, of Accrington, Lancaster, manufacturer. *Improvements in looms and apparatus for weaving.* Patent dated March 9, 1855. (No. 529.)

This invention relates—1. To an improved method of preventing what are technically called "floats" being made in the cloth during the process of weaving, which is accomplished by placing a coarse reed divider or leaf of healds without eyes in front of the ordinary healds, and causing it to move backwards and forwards between the warp threads whilst there is no obstruction, but if a float is in the course of formation it will prevent the forward motion of the said coarse reed or divider, and by means of a suitable apparatus will stop the loom. 2. To a method of preventing the warp-threads becoming entangled in the shed when any of them break, which is accomplished by having an extra leaf of healds or a divider moving backwards and forwards between the yarn, and placed behind the ordinary healds, which motion combs, or throws back any end or ends which may stick in the yarn, thereby preventing any obstruction to its proper shedding, &c.

MURDOCH, JAMES, of Staple-inn, Middlesex. *An improved method of enlarging or reducing designs, maps, and other similar articles; also apparatus or machinery to be employed in the same.* (A communication.) Patent dated March 9, 1855. (No. 531.)

Claims.—1. Enlarging designs, maps, and other similar articles by transferring the design to a sheet of caoutchouc (or other suitable elastic material), and then stretching the material equally in all directions; and reducing such designs by transferring them to a sheet of caoutchouc (or other suitable elastic material), previously equally stretched in all directions, and then allowing the material to shrink or contract equally in all directions. 2. Certain apparatus to be used in carrying out the above arrangements.

LISTER, SAMUEL CUNLIFFE, of Manningham, near Bradford, York. *Improvements in treating and preparing the fibres of flax and hemp, and other fibrous substances for spinning.* Patent dated March 9, 1855. (No. 534.)

Claim.—Combining mechanical parts into a machine in such manner that the fibres, being fed endways, or in the form of a sliver into the machine, are first hackled, or acted upon by points on both sides, then detached, and held by nipping or holding apparatus, in such manner that the other end of the detached quantity of fibres is hackled or

acted on by points on both sides, and then the detached quantities are pieced up without requiring the workman to handle the fibres from time to time as heretofore.

BOUSFIELD, GEORGE TOMLINSON, of Sussex-place, Loughborough-road, Brixton, Surrey. *Improvements in preparing wool and other fibrous substances for spinning.* (A communication.) Patent dated March 9, 1855. (No. 535.)

Claim.—Subjecting slivers of wool and other fibres, after they have received the last combing, to the action of combs or rows of points, travelling progressively faster and faster as they recede from the point at which they entre the fibre.

LISTER, SAMUEL CUNLIFFE, of Manningham, near Bradford, York. *Improvements in machinery for combing wool and other fibres.* Patent dated March 9, 1855. (No. 538.)

This invention consists in combining mechanical parts into a machine in such manner that the end of a sliver or slivers of wool or other fibres may by it be first cleaned by a comb or teeth, then placed beyond the comb or teeth, and taken and detached by nipping or holding apparatus from the teeth, and transferred in such manner that the successive detached and cleaned portions may be pieced up, or formed into a sliver.

SMITH, WILLIAM, of Salisbury-street, Adelphi, Middlesex. *Safety harness.* (A communication.) Patent dated March 9, 1855. (No. 539.)

The inventor describes an arrangement which enables the coachman, by means of a slight jerk of a safety-rein always kept within reach, to immediately release the horses, and drop the whole of the harness, and to guide the carriage by the pole till it stops of its own accord.

CLARK, ALEXANDER, of Gate-street, Lincoln's-inn-fields, Middlesex, engineer. *Improvements in the construction and manufacture of celestial and terrestrial globes for the study of astronomy and geography.* Patent dated March 10, 1855. (No. 541.)

This invention relates to the foundations on which are placed the paper segments or gores representing the earth's surface, or the position of the celestial bodies, which consist in the present case of hollow glass globes, the map or printed representation, which is placed inside, being protected thereby. The invention further relates to the application of glass hemispheres to the surface of globes constructed in the ordinary manner, in order to afford protection to them.

HEAVEN, CHARLES, of Hull. *Improvements in machinery used for embroidering fabrics.* Patent dated March 10, 1855. (No. 544.)

This invention consists in the application of a series of bent blades, or other suitable instruments, whereby each thread is formed into a loop through which the needle passes, so as to form, when the thread is tightened, a stitch similar to the button or loop-hole stitch.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Improvements in machinery for making butt-hinges of wrought iron or other metal complete at one operation.* (A communication.) Patent dated March 10, 1855. (No. 545.)

This invention relates to the novel construction, arrangement, and combination of certain mechanical devices and appliances for punching, bending, and cutting the metal to form the two parts of a hinge, for fitting them together, inserting the pin, and closing the joint, and for carrying them from one to another of the whole of successive stages of the manufacture in the same machine.

MALCOMSON, JOSEPH, of Portlaw, Waterford, Ireland, merchant, ROBERT SHAW, of the same place, merchant, and WILLIAM HORN, of Mark-lane, London, engineer. *Improved expansion valves for steam engines.* Patent dated March 10, 1855. (No. 547.)

Claim.—"Constructing expansion valves for steam engines by the combination of a slide valve with a gird valve, or valves mounted upon it, and working in a direction transverse to the direction of the motion of the slide valve."

BRANDON, DAVID HUNTER, of Beaufort-buildings, Strand, Middlesex. *Certain improvements in machinery or apparatus for cutting fustians and other piled fabrics.* (A communication.) Patent dated March 12, 1855. (No. 548.)

In carrying out this invention two drums or cylinders are placed parallel to one another, and mounted on suitable frames, on one of which the stuffs are rolled uncut, the outside end being attached to a short apron connected with the second drum, which is caused to revolve so as to unroll the stuff from the first cylinder on to itself until the whole piece has changed drums. It is during the passage from one drum to another that the operation of cutting is performed by as many stationary knives or blades as there are rows of loops in the width of the stuff. For this purpose the stuff is made to pass over a small table of about the same width as the stuff, and slightly raised above the surface of the drums. The knives are adjusted on a bar running across and above the stuff with their points directed towards the loops which are advancing. The fabrics are distended by suitable apparatus during the cutting.

HULLS, JAMES, of Plaistow, Essex, and

JOHN LOWE, of Lambeth-road, Surrey. *Improvements in coating iron and other metals with lead.* Patent dated March 12, 1855. (No. 550.)

This invention relates to certain methods of preparing the surfaces of metals to be coated with lead. These methods are somewhat different for different metals. The following is the process for preparing iron. The iron is first submitted to the action of dilute sulphuric acid in order to remove the scale from its surface. This first bath consists of 1 part by weight of sulphuric acid mixed with 3 parts of distilled water. The iron is allowed to remain in this from five to eight hours, according to the state of its surface, which may be judged of by examining it from time to time as the work progresses. The iron when removed from this bath is to be thoroughly scoured with fine sand, and cleansed in distilled water, to free it from all trace of the sulphuric acid, and to remove loose matters from the surface. It is then to be immersed for a few minutes in a bath consisting of 1 part of ammonia and 16 parts of distilled water. When removed from this bath it is submitted to the action of chloride of zinc, by immersion during 1 hour in a bath formed by dissolving 1 part by weight of zinc in 7 parts of hydrochloric acid, and afterwards plunged in a solution of sal-ammoniac, mixed in the proportion of 1 part of sal-ammoniac to 20 parts of distilled water.

GILBERT, JOHN, of the Engine Works, Boston-street, Hackney, Middlesex, engineer. *An improved pump or pumping apparatus.* Patent dated March 12, 1855. (No. 552.)

Claim.—An arrangement of machinery whereby a flexible diaphragm is made alternately to create and fill a vacuum or partial vacuum in a chamber fitted with inflow and exit pipes and valves, whereby liquids and other matters requiring to be pumped will be drawn into and forced out from the chamber.

STANLEY, WILLIAM PROCKTER, of Peterborough, Northampton, agricultural implement maker. *An improvement in or addition to clod-crushers.* Patent dated March 12, 1855. (No. 553.)

Claim.—The adaptation of scrapers or cleansing instruments to clod-crushers composed of a series of circles or wheels mounted independently, and free to revolve round a common axis.

SCORE, WILLIAM, of Bristol. *An improvement in bleaching oils, fats, and resin.* Patent dated March 12, 1855. (No. 554.)

This invention consists in causing oils, fats, and resin, when in a heated state, to be thrown by centrifugal action through fine wire gauze or other suitable substance, into a bleaching atmosphere contained in an enclosed chamber.

NAPIER, JAMES MURDOCH, of York-road, Lambeth, Surrey. *Improvements in the furnaces used in the manufacture of soda or alkali.* Patent dated March 12, 1855. (No. 555.)

This invention mainly consists in constructing a furnace bottom of a series of shelves or surfaces, which, by their movement, cause the materials under process progressively to be moved from one to the next, and thus the materials to be dried and roasted or carbonated may be constantly, or at short intervals, received at one and delivered at the other end of a furnace.

MACAIRE, DAVID, gentleman, of Paris, France. *Improvements in casks and taps.* Patent dated March 13, 1855. (No. 556.)

This invention consists in giving an unvarying gauge to casks by keeping together the iron hoops with which they are hooped, by means of longitudinal strips of iron, or any other suitable metal, to which each hoop is secured by means of screws passing through the hoops and the strips, and screwed into the staves of the barrel. Also in various modifications of the forms of taps and vent pegs.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GERARD, JOHN, of Guernsey. *A portable floating pier or bridge, separating into sections, which are designed and adapted for forming floating vessels, also fixed and moveable structures on land, such as sheds and vehicles.* Application dated March 8, 1855. (No. 526.)

This floating pier or bridge consists of portable floating vessels, with moveable water-tight decks, sides, ends, and bottoms, and sliding or floating frames, platforms, stays, and supports, the whole being made and fitted together in sections composed of, and separating into duplicate parts, designed for forming a portable extending pier, bridge, or platform.

WHITE, GEORGE, of Laurence Pountney-lane, Cannon-street, London, agent. *Improvements in the treatment of horn and other substances of a similar nature.* (A communication.) Application dated March 9, 1855. (No. 527.)

These improvements consist in incorporating or amalgamating with one or with several of the said substances a suitable quantity of vulcanized, or non-vulcanized, India-rubber, gutta percha, or both of them, by any suitable means.

DALL, PATRICK, of Woolwich, Kent,

[redacted]

engineer in the Royal Navy. *Improvements in self-acting, indicating, and recording mechanism for steam engines.* Application dated March 9, 1855. (No. 528.)

The inventor describes an apparatus which is intended to indicate—1. The number of revolutions per hour. 2. The amount of steam pressure in lbs. per square inch in the boiler. 3. The time at which the expansion has been thrown into or out of gear, and also the position of the valve gear. This apparatus consists of a revolving cylinder or drum, actuated by clock-work, and making one revolution in twelve or twenty-four hours, or in any other convenient period of time, round which cylinder is lapped temporarily a sheet of paper which has been previously divided or ruled for the purpose of facilitating the reading off of the several indications. The indications are all marked in lines by pencils or trackers resting on the paper. The pencil for indicating the number of revolutions per hour is carried by an arm which traverses along a shaft or spindle, having a spiral groove cut in it, and this shaft is actuated from a second shaft by a screw and worm-wheel, the second shaft being driven by ratchet mechanism from the engine itself. A vernier scale is also connected with the pencil holder, and serves to indicate to the engineer at a glance, the speed of his engine. The pencil for the steam pressure indicator is fitted to an ordinary steam indicator connected with the boiler, and as the pressure increases or diminishes, so will the pencil traverse backwards and forwards along the paper on the drum. The pencil for recording the expansion is carried on a holder connected with the expansion gear, so that when the expansion is thrown in or out of gear, the same will be indicated by the pencil, and when in gear the particular notch or grade will be also shown on the record paper.

Murdoch, James, of Staple-inn, Middlesex. *An improved shade or reflector for lamps.* (A communication.) Application dated March 9, 1855. (No. 530.)

In this invention an interior conical shade is surmounted or surrounded by a straight or nearly straight-sided or cylindrical shade. The interior shade is formed of a diaphonous or partially transparent material, as silk, paper, gauze, glass, &c.

Barnet, Francis Augustus, of Nelson-street, Bristol. *An improvement in the manufacture of metallic bedsteads and couches for the use of invalids, applicable to bedsteads and couches made from any other material.* Application dated March 9, 1855. (No. 532.)

In using this invention, a sick or other person lies upon a sacking and upper frame, which can be gradually and horizontally raised up from and lowered down upon a mattress or bed placed upon an under bedstead, by means of a handle placed at the foot of the bedstead.

Hill, Thomas, of the Birches, Stanton Lacey, Salop, land agent. *Certain machinery or apparatus to be employed in the manufacture of bricks, drain pipes, tiles, and other like articles from plastic materials.* Application dated March 9, 1855. (No. 533.)

This machinery is intended to be applied between the pug-mill and the moulds. It consists of a frame composed of two sides, and of a curved bottom plate with bearings in the side plates of the axis of a wheel or drum. This drum has four slots equidistant from each other, each pair of slots being exactly opposite each other. Through these slots work four valves or plungers, each pair of plungers being connected on the inside of the drum by right and left-handed screws, so that the distance they are to protrude may be regulated. One end of the frame receives clay from a pug-mill, or other suitable source, the drum is caused to rotate, and the plungers carry forward the clay and deliver it at the other side of the frame into a box to which the moulds or discs are fitted. The plungers are so arranged as to follow the curve of the bottom plate, and as each plunger commences to deliver its charge, it begins to recede within the drum.

Lister, Samuel Cunliffe, of Manningham, near Bradford, York. *An improvement in combing the noil of silk waste.* Application dated March 9, 1855. (No. 536.)

The inventor applies two or more drawing apparatus to a comb used for combing the noil of silk waste, the succeeding drawing rollers being placed continually nearer to the teeth of the comb.

Mickle, William, of Willington, Durham, colliery-agent. *Improvements in the smelting or production of iron from its ore in blast furnaces.* Application dated March 10, 1855. (No. 540.)

These improvements "consist in infusing, blowing, or injecting coal gas or other inflammable or combustible gas or gases into a blast furnace or blast furnaces, for the purpose of smelting, or assisting in the smelting of iron, or obtaining iron from iron ores."

Sunderland, Joseph, of Marsden, near Burnley, Lancaster, grocer. *Improvements in self-acting apparatus for controlling or regulating the flow of liquids from casks or other vessels.* Application dated March 10, 1855. (No. 542.)

In using this apparatus a tap is opened by hand, and may then be left to itself to

discharge the liquid into a vessel below; but when this vessel is full, or nearly so, a float inside it will be elevated, thereby depressing the opposite end of a lever, and releasing a ratchet wheel, by removing a pall or detent therefrom, upon which a hanging weight descends and turns a drum that winds up a cord attached to a lever and thus closes the tap.

HUGHES, JOHN, of Ukside Iron Works, Newport, Monmouth. *An improvement in bushing the touch-holes of cannon.* Application dated March 10, 1855. (No. 543.)

This invention consists in forming the touch-holes of cannon with movable bushes of steel or other suitable metal.

BRISCO, ROBERT, of Low Mill House, Saint Bees, Cumberland, esquire, and PETER SWIRES HORSMAN, of St. John's Beckermet, in the same county, gentleman. *Certain improvements in the preparation of flax.* Application dated March 10, 1855. (No. 546.)

In carrying out this invention, after the scutched or partially scutched flax has been sufficiently fermented the water is run off, and whilst the fermented flax is in a saturated and wet state, and previous to its being dried, the inventors expose it to the action of hot or cold solutions of alkali, acid, and soap, the hot being preferred, for the purpose of dissolving the gum, resins, and skin of the plant.

BROOKS, JOHN, of Birmingham, Warwick, manufacturer. *A new or improved waistcoat.* Application dated March 12, 1855. (No. 549.)

The lower collar of the improved waistcoat forms an elliptical opening which displays the front of the shirt, giving a bulged or convex form to the same. In the inside of the waistcoat, and under the lower collar, are flaps provided with buttons and button holes, by which the front of the waistcoat can be completely closed, and the shirt front defended.

MOSLEY, GEORGE, of Southwark, Surrey, button-maker. *An improvement in buttons.* Application dated March 12, 1855. (No. 551.)

This invention consists in making the shanks of buttons of an elastic material.

BOURSERET, EUGENE, mechanician, of Paris, France. *Improvements in machines for manufacturing bolts, rivets, and other similar articles.* Application dated March 13, 1855. (No. 557.)

These improvements consist in employing one mechanical arrangement for forging the articles, another for cutting a screw to those that require it, and a third for turning the heads.

PROVISIONAL PROTECTIONS.

Dated May 28, 1855.

1218. Joseph Leese, junior, of Manchester, Lancaster, manufacturer. An improvement or improvements for obtaining colouring matter.

Dated July 21, 1855.

1648. William Striby, of Weinheim, duchy of Baden, professor of music. A new and improved system of musical notation.

Dated September 1, 1855.

1971. Matthew Butcher, of Birmingham, Warwick, manufacturer, and Thomas Henry Newey, of Birmingham, machinist. An improvement or improvements in the manufacture of bobbins used in winding, twisting, and weaving fibrous substances.

1973. Thomas Dodds, of Wigmore-street, Cavendish-square, London, military and travelling equipage manufacturer. Improvements in the construction of an apparatus for heating all kinds of furnaces with coal or other gases.

1975. Frederick Crace Calvert, of Manchester, Lancaster, professor of chemistry. Improvements in the treatment of heating, puddling, and refinery iron slags or cinders.

1977. Thomas Symes Prideaux, of Willow House, Hampstead, Middlesex, engineer. Improvements in marine steam-boiler furnaces and flues.

1979. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in the manufacture of gas for illumination. A communication.

Dated September 3, 1855.

1981. William M'Liesh, of Belfast, Antrim, Ireland, manufacturing chemist. Improvements in steam-boiler and other furnaces, and in the prevention of smoke.

1982. Alfred Heaven, of Manchester, embroiderer by machinery. Improvements in embroidering fabrics.

1983. George Thomas Holden and Richard Nicholas, of Brook-street, St. Paul's, Birmingham, Warwick, manufacturers. An improved roasting-jack.

1985. James Timmins Chance, of Birmingham, and Henry Adcock, of the same place. Improvements in casting articles of the slags produced by the smelting of iron and other ores.

1987. Edouard Sy, machinist, of Paris, France. A new method of obtaining motive power.

1989. Henry Edward Flynn, of Retreat Ranelagh, Dublin, gentleman. Making connections between and adapting appliances to locomotives and all descriptions of railway carriages, whereby the possibility of accidents resulting from the breakage or dislocation of their wheels or axles is prevented, or the chances thereof greatly diminished.

1991. John Humby, of Little Britain, London, surgeon dentist. An improved machine for cutting vegetables.

1993. George Hearnden Golding, of Maidstone, Kent, engineer. A tool or apparatus to be used in the blocking and lasting of leather, and in other cases where a covering is required to be drawn over a solid substance.

Dated September 4, 1855.

1995. Cyrus Clark and James Clark, of Street, near Glastonbury, Somerset, rug manufacturers. An improvement in the manufacture of boots and shoes.

1997. John George Taylor, of Glasgow, Lanark, merchant. Improvements in coating, covering, or plating metallic surfaces.

1999. Thomas Taylor Coniam, of Chagford, Devon. Improvements in tiles for roofing.

2001. Charles Gustave Mueller, of South Carolina, United States of America. Certain new and useful improvements in locks for doors.

2003. William Armand Gilbee, of South-street, London, gentleman. Improvements in the manufacture of glass. A communication from Monsieur Salmon, of Paris.

2005. William Southwell, of Philadelphia, Pennsylvania, United States of America. Certain improvements in machinery for grinding or polishing saws and other articles.

Dated September 5, 1855.

2007. George Henry Ingall, of Bartholomew-lane, London, gentleman. Certain improvements in railway self-acting signal-posts and apparatus connected therewith.

2009. George Collier, of Halifax, York. Improvements in the manufacture of carpets and other pile fabrics.

2011. John Hamilton Glassford, of Glasgow, Lanark, lithographer. Improvements in printing textile fabrics and other surfaces.

2013. Joseph Gilbert Martien, of Newark, New Jersey, United States of America. Improvements in roasting, calcining, oxydizing, and subliming, metallic and mineral substances, and in the apparatus and means to effect the same.

Dated September 6, 1855.

2015. Samuel Aspinwall Goddard, of Birmingham, Warwick, merchant and gun manufacturer. A new or improved method of preventing the injurious fouling of the barrels of fire-arms, and of cleaning the same when fouled.

2017. Christopher Penrhyn Aston, of Cross-street, Middlesex, gun-barrel maker. Improvements in breech-loading arms.

Dated September 7, 1855.

2021. George Lowry, of Manchester, machinist. Improvements in machinery for heckling flax and other fibrous materials.

2023. Florentin Garand, of Paris, France. Improvements in machinery for cutting veneers.

2025. Nathaniel Templeton, of Glasgow, Lanark, manufacturer, and David Miller, of the same place, manager. Improvements in the manufacture of figured fabrics.

2027. John M'Intyre, of Jarrow-upon-Tyne, Durham, iron ship-builder. Improvements in apparatus for caulking decks, ceilings, and floors.

2029. Louis Prosper Reynaud, of Paris, mechanician. A new system of endless stair-crane.

Dated September 8, 1855.

2031. Eugene Hippolyte Rascol, of Catherine-street, Strand, Middlesex. An improved fastening for articles of wearing apparel, and for other purposes, as a substitute for buttons. A communication.

2033. Joseph Henry Tuck, of Pall Mall, Middlesex, civil engineer. Improvements in dredging and excavating machinery. A communication.

2035. Thomas Hemsley and William Hemsley, of Melbourne, Derby, lace manufacturers. Improvements in the manufacture of fabrics in warp and twist lace machines.

2037. James Bird, of Seymour-street West, Middlesex, surgeon. An improvement in the manufacture of biscuits.

2039. Pier Alberto Balestrini, of Brescia, Lombardy, gentleman. Improvements in insulating wires for electric telegraphs.

2041. Andrew Robertson, of Nether Holehouse, Neilston, Renfrew, bleacher. Improvements in the treatment, cleansing, and finishing, of textile fabrics.

2043. Eugène Grenet, junior, civil engineer, of Paris, French Empire. An improved electro-magnetic apparatus for motive-power, part of which may be employed separately for the generation of electric currents.

2045. Thomas Allan, of Adelphi-terrace, Westminster, civil engineer. Certain means of correcting or preventing the deviation of the compass needle from local attraction.

Dated September 10, 1855.

2050. Auguste Edouard Loradoux Bellford, of Essex-street, London. An improved governor for steam engines. A communication.

Dated September 13, 1855.

2066. John Macintosh, of Great Ormond-street, Middlesex. Improvements in metallic and other pens.

Dated September 14, 1855.

2072. Jules Albert Hartmann, chemist, of Mulhouse, French empire. Certain improvements in the preparation and combination of colours for printing stuffs and textile fabrics.

2074. William Church, of Birmingham, Warwick, engineer. Improvements in mounting and adjusting ordnance and other fire-arms.

2076. Vincent Scully, esquire, and Bennett Johns Heywood, gentleman, both of Dublin. Improvements in bottles, inkstands, and other vessels, and in caps or stoppers for closing the same.

2078. Frederick Stocken, of Halkin-street, Belgrave-square, Middlesex. Improvements in carriage springs.

Dated September 15, 1855.

2080. William Oxley, of Manchester, engineer. Improvements in machinery or apparatus for washing fabrics and other substances.

2082. Joseph Gilbert Martien, of Newark, New Jersey, United States of America. Improvements in the manufacture of iron and steel.

2084. Vincent Scully, esquire, and Bennett Johns Heywood, gentleman, both of Dublin. An improvement in the manufacture of certain articles which are subject to the corroding action of the air and moisture.

2086. William Sangster, of Cheapside, London. An improvement in the manufacture of stays and corsets.

2088. David Zenner, of Newcastle-upon-Tyne, practical chemist. Improvements in washing and separating pulverised ores and matters. A communication.

2090. Alfred Ford, of St. James's, Middlesex, gentleman. Improvements in preparing solutions of caoutchouc, gutta percha, and like gums for waterproofing and other useful purposes.

Dated September 17, 1855.

2092. Joseph Lewtas, of Manchester, manufacturer of Venetian and other blinds. Improvements in apparatus for holding and letting go cords, chains, or bands.

2094. Thomas Forsyth, of Manchester, Lancaster, engineer. Improvements in the treatment of scrap iron in the process of manufacture.

2096. William Handasyd Smith, of Birmingham, Warwick, builder. An improvement or improvements in bolts, latches, and locks.

2098. James Tennant Caird, of Greenock, Renfrew, North Britain, civil engineer. Improvements in steam engines.

2102. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in obtaining raw silk, which are also applicable to fibres worked in a wet state. A communication.

Dated September 18, 1855.

2100. Richard Archibald Brooman, of 166,

Fleet-street, London, patent agent. Improvements in knitting machinery. A communication.

2108. Feridoon Hankey Smith, of Ludgate-hill, London, engineer. An improved break for carriages with poles.

2110. William Warren, of Regent-place, Birmingham, Warwick, machinist. Improvements in the construction of vices.

Dated September 19, 1855.

2112. Louis Cornides, of Trafalgar-square, Charing-cross. Certain improvements in obtaining impressions of prints or drawings and in transferring, printing, and colouring, or ornamenting the same on glass or other surfaces.

2114. Samuel Coulson, of Sheffield, metallurgist. An improvement in the manufacture of ornamented metal tea-pots, coffee-pots, milk-jugs, and sugar-basins.

2116. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in preserving animal and vegetable substances. A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 2nd,* 1855.)

1126. Robert John Stainton and Edmund Charles Davey. Improvements in the construction of warming and other stoves for generating and radiating heat, and also for economising combustion therein and attention thereto.

1130. Benjamin Nicholls. Improvements in the manufacture and construction of buttons.

1137. Harry Whitaker. Improvements in the propulsion of steam-vessels, by a direct application of a crank outside the hull to side screw propellers, such application being combined with a high pressure engine, also outside the hull.

1149. John Henry Johnson. Improvements in the process of vulcanising and rendering hard India rubber and gutta percha, and in the application of those materials, when hard, to the construction of parts of machinery or apparatus employed in the preparation and manufacture of fibrous materials and textile fabrics. A communication.

1151. Henry Emmanuel Scott. Improvements in ships and other floating vessels.

1157. Johan Jacob Meyer. Improvements in machinery or apparatus for shaping wood and other materials.

1164. William Smith. Improvements in safety apparatus for mine shafts, and other hoists. A communication from M. Nicholas Joseph Jacquet, of Arras, France.

1165. William Smith. A safety apparatus for steam boilers. A communication from M. Adolphe Lethwilleon Pinel, of Rouen, France.

1166. William Smith and Nathaniel Fortescue Taylor. Improvements in meters for measuring gas and other fluids.

1170. James Park. Improvements in machinery for manufacturing paper pulp.

1172. Charles Rawlings. Improvements in writing-desks.

1179. Joseph Addenbrooke. Improvements in machinery for folding envelopes.

1191. Frederick Herbert Maberly. Improvements in fire-arms.

1193. Thomas Mather. Improvements in the construction of pistons.

1198. Jean Ciancaleone Rieu and Carlo Bartocci. A new beverage.

1199. Charles Weightman Harrison. Improvements in metal ropes, cables, and rods, and in machinery for manufacturing the same.

1206. François Théodore Botta. A new construction of furnaces, called mixed furnaces, participating of the heating by the solid fuel, and by the combustion of the gaseous products.

1213. John Morrison. A new mode of constructing railways specially intended to be employed for the transit of carriages or vehicles moved or propelled by human power.

1215. Eugène Michel Roch. Improved apparatus for reading, or bringing into sight, bills, advertisements, papers, maps, and similar objects.

1218. Joseph Leese, junior. An improvement or improvements for obtaining colouring matter.

1228. William Langshaw and George and William Jelley. Improvements in machinery for manufacturing fancy fabrics with both sides alike.

1272. William Eley. An improvement in the manufacture of detonating caps for fire-arms.

1283. Thomas Barrows. Improvements in the treatment of wool.

1298. Pierre Antoine Favre. Certain improvements in employing the residue arising from the lixiviation of crude sodas.

1363. James Timmins Chance. Improvements in glass-flattening furnaces. A communication.

1433. Simon Eugène Gabriel Simon. The use of a new material in the manufacture of paper.

1460. François Vennin Derégniaux. Improvements in the construction of spinning-machinery.

1478. Robert Besley. An improved manufacture of metallic alloy, applicable to the casting of type and other articles. A communication.

1588. Edwin Senior Atkinson. Apparatus for condensing or absorbing muriatic acid gas from the furnaces of kilns used in the manufacture of sulphate of soda.

1629. David Fisken and Thomas Robert Hay Fisken. Improvements in transmitting steam or other power for the tillage of land by ploughs and other implements, as well as for other purposes, and machinery for applying the power so transmitted.

1742. Richard Archibald Brooman. Certain improvements in manufacturing paper, pasteboard, and pulp. A communication from H. V. Pinondel de la Bertoche, of Paris.

1763. Henry John Betjemann. Improvements in extending tables. A communication.

1883. William Soelman. Improvements in the construction of propellers.

1975. Frederick Crace Calvert. Improvements in the treatment of heating, puddling, and refinery of iron slags or cinders.

1985. James Timmins Chance. Improvements in casting articles of the slags produced by the smelting of iron and other ores.

1995. Cyrus Clark and James Clark. An improvement in the manufacture of boots and shoes.

1998. William Henry James. Improvements in steam engines.

2001. Charles Gustav Mueller. Certain new and useful improvements in locks for doors.

2002. Warren De la Rue. Improvements in treating Burmese naphtha when obtaining products therefrom.

2009. George Collier. Improvements in the manufacture of carpets and other pile fabrics.

2012. George Peacock. Improvements in ship-building.

2021. George Lowry. Improvements in machinery for heckling flax and other fibrous materials.

2035. Thomas Hemsley and William Hemsley. Improvements in the manufacture of fabrics in warp and twist lace machines.

2037. James Bird. An improvement in the manufacture of biscuits.

2041. Andrew Robertson. Improvements in the treatment, cleansing, and finishing of textile fabrics.

2045. Thomas Allan. Certain means of correcting or preventing the deviations of the compass-needle from local attraction.

[redacted]

2056. François Honoré Lebaigue. An improvement in the manufacture of chocolate.

2066. John Macintosh. Improvements in metallic and other pens.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

4. James Hodgson.
6. Moses Poole.
9. George Green.
11. Thomas Wood Gray.
12. Thomas Wood Gray.
16. Moses Poole.
19. Moses Poole.
20. Charles Frederick Bielefield.
24. Moses Poole.
28. Moses Poole.
29. John Daniel Ebingre.
30. Moses Poole.
33. Moses Poole.
36. James Hare.
37. Moses Poole.
40. Frederick Richard Holl.
41. Joseph Barrans.
42. Oswald Dodd Hedley.
43. Moses Poole.
49. Edmund Morewood and George Rogers.
51. Thomas Craddock.
56. John Finlay.
64. Henry Richardson Fanshawe.
70. Robert Larkin and William Henry Rhodes.
71. John Ambrose Coffey.
74. Christopher Kingsford.
77. Stephen Soulby.
81. Henry Mortlock Ommanney.
84. Edwin Pettitt.
86. David Dunne Kyle.
87. Robert Robertson Menzies.
95. William Oxley.
96. Henry Bridson.
100. William Potts.
103. Charles Lungley.
108. Thomas Fearn.
110. John Wright and Edwin Sturge.
115. Charles John Carr.
120. George Collier.
121. John Lee Stevens.
123. Richard Whytock.
136. William George Nixey.
137. Arthur Jackson.
140. Thomas Robson.
141. Astley Paston Price.
142. Henry Bernoulli Barlow.
156. Joseph Brown.
160. Joseph Burch.
163. Moses Poole.
165. Moses Poole.
172. John Jobson.
181. William Edward Newton.
184. Joseph Needham.
187. Alexander Miller.
188. John Weems.
205. Martin Billing and Charles Henry Street.
210. Henry Webb and Joseph Froysell.
214. Thomas Kennedy.
216. Archibald Brown.
222. Aristide Balthazard Berard.
231. George Walker Nicholson.
234. John Balmforth, William Balmforth, and Thomas Balmforth.
238. William Gilbert Elliott.
245. William Dray.
246. George Hallen Cottam.
247. Christopher Nickels and Frederick Thornton.
251. Auguste Edouard Bellford.
254. Robert Shaw.
259. George Walker Nicholson.
260. William Coles Fuller and George Morris Knevitt.
264. Alfred Vincent Newton.
269. William Vaughan Morgan.
272. Joseph Hill.
275. Alphonse René le Mire de Normandy.
278. William Adolph.
280. William Bissell.
282. John Blair.
285. Edwin Pettitt and James Forsyth.
290. William Horsfield.
292. Samuel Rainbird.
296. Alfred Trueman.
298. Edward Joseph Hughes.
321. Samuel Hardacre.
324. Thomas Restell.
326. Charles William Siemens.
335. Robert Cochran.
354. Joseph Walker.
371. Walter McFarlane.
376. Henry McFarlane.
407. Charles Henry Waring.
448. James Ottams.
510. John Tayler and James Slater.
543. John Norton.
545. Charles Benjamin Normand.
565. William Henry Fox Talbot.
698. Oswald Dodd Hedley.
710. James Noble.
761. Samuel Holt.
785. Peter Carmichael.
798. Jean Joseph Pierrard.
808. George Wilson.
908. Francis William Ellington.
1013. George Collier.

LIST OF SEALED PATENTS.

Sealed September 25, 1855.

795. Léopold Oudry and Alphonse Oudry.
805. James Lee Norton.
812. William Terry.
814. Jules Lalemhn.
1007. Samuel Roberts.
1144. Alexander Henry Mentha.
1301. Moses Heap.
1335. Isaie Lippmann.
1385. Thomas Blanchard.
1452. Moses Poole.
1570. Samuel Cunliffe Lister.
1573. Richard Hornsby.
1596. William Edward Newton.
1603. Henry Samuel Bosse.
1618. William Ball and John Wilkins.
1684. Benjamin Bailey.
1722. James Kerr.
1728. Charles Piper.
1732. John Hanson.

Sealed September 28, 1855.

695. François Joseph Anger.
704. William James.
727. Thomas Hedgcock.
731. John Taylor.
748. Henry Richardson Fanshawe and John Americus Fanshawe.
806. Soren Hjorth.
808. Soren Hjorth.
811. Isaiah Vernon.
830. Gustave Irenée Soulfort.
849. Henry Woodhouse.
1116. William Johnson.
1212. Edward George Swinton.
1255. John Charles Pellenz.
1370. John Harvey Sadler.
1507. James Connor.
1662. Henry William Ripley.
1752. Richard Albert Tilghman.
1798. Charles Frederic Thomas.

Sealed October 2, 1855.

729. Frederick Phillips.
737. François Theodore Botta.

Errata.—The specification of Mr. Hotchkiss, which was noticed among the abstracts of "Provisional Specifications not Proceeded with," on page 308 of our last number, should have appeared among the abstracts of "Specifications of Patents recently Filed," as the patent was duly completed.

Last number, page 295, column 1, line 14 from bottom, *for* allusion *read* illusion; page 300, col. 1, line 32 from top, *for* continued *read* consumed.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1679.] SATURDAY, OCTOBER 13, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

PEARCE'S PATENT STEAM HAMMER.

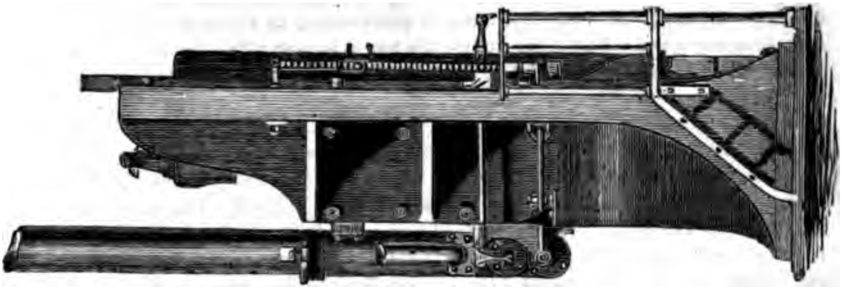


Fig. 2.

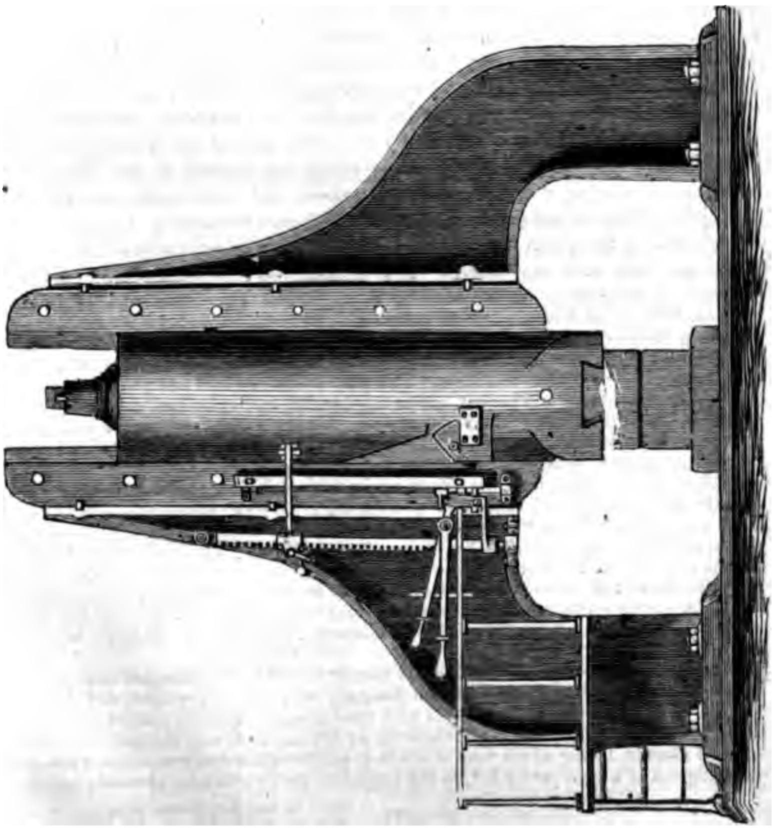


Fig. 1.

PEARCE'S PATENT STEAM HAMMER.

(Patent dated January 13, 1855.)

To the Editor of the Mechanics' Magazine.

SIR,—I beg to hand you two views, viz., fig. 1 a front, and fig. 2 a side elevation, of my Patent Improved Steam Hammer, of medium size, as fitted up for ordinary purposes, and shall be glad if you can spare room for them in your very useful Magazine. I have some idea of the difficulty you must experience in endeavouring to satisfy the numerous calls upon your pages, and will therefore not trouble you at present with a detailed description. Indeed such a description would be of little use to the practical man, and quite useless to many of your readers.

The main feature of the invention consists in disposing the steam cylinder at the side of the hammer-block, where it is firmly bolted between the parallel cheeks of the main framing, by which means the stability of the whole machine is wonderfully increased, the total height considerably diminished, and the use of props and stays rendered altogether unnecessary. The hammer-block is made of any desirable length, thereby securing ample length of guiding surface. The piston-rod is attached to a strong projection on the upper end of the hammer-block which projects over the cylinder, as seen in fig. 2. The valves, two of which are employed, one for the self-acting motion and one for hand working, are situated at the lower part of the back of a steam cylinder, the working connections being carried round to the front of the machine, as shown in the engravings. Each of these valves is provided with steam and exhausting passages, thus giving the attendant the most perfect control of the hammer, independent of the self-acting motion. The steam and exhausting pipes spring up from the valve-box, the latter having a branch thoroughfare communicating with the upper part of the cylinder, for equalising the pressure on both sides of the piston during the descent of the hammer. This arrangement renders easy access to the valves and valve gear, and affords great facility for taking out and examining the piston without disconnecting it from the hammer-block. To get the piston out, it is simply necessary to take the nuts off the cylinder-lid bolts, and then hoist the hammer-block by means of the forge-crane to a sufficient distance up the guides. In the ordinary steam hammer the piston-rod is very frequently broken. This arises from the intense compression to which its particles are exposed at every blow; in the present arrangement the action of the blow, on the contrary, subjects the rod to extension which the material is best calculated to resist. The piston-rod is consequently not at all liable to such accidents. The piston is formed of one piece of wrought iron as light as consistency will permit, and is fitted with a particular kind of very light metallic packing, which is found to be very durable. All the stuffing-boxes are arranged so as not to be in contact with the steam; the stuffing, being used merely to prevent escape from the exhausting passages, requires little or no attention. The improved method of raising and lowering the tappet lever by means of the rack and pinion is found to answer well; it enables the attendant to lengthen or shorten the self-acting stroke with ease and rapidity. The adoption of the double acting hand valve in combination with the self-acting valve apparatus is a very simple, but highly important addition. The application of the piston-rod to one side of the hammer-block appears at first sight rather objectionable, but in practice the objection is quite imperceptible; the motion is particularly smooth and steady. The adjustable guide plates are provided to prevent too much play in the slides, but experience shows them to be scarcely necessary, owing to the increased length of the hammer-block.

Seeing that this rough description has already exceeded the intended limits, I will conclude by stating, that a very powerful hammer, viz., six tons weight, and five feet six inches stroke, fitted up in accordance with these improvements, is erected at the Bowling Iron Works, near Bradford, and has been in regular and very successful operation for several months, during which time it has been employed for every variety of work, from the drawing out of a light porter bar, to the forging of the largest class of cranks and shafts.

I am, Sir, yours, &c.,

J. C. PEARCE.

[redacted]

HOTCHKISS'S IMPROVED PROJECTILES FOR ORDNANCE.

(Patent dated March 5, 1855.*)

Mr. Hotchkiss, of New York, patented in this country, on the above day, a method of constructing a cast-iron shot, so that it shall be capable of being fired from rifle cannons, and also shall have effects similar to the slugging of balls in breech loading guns. The shot is made in three distinct parts, two being of cast iron or similar metal, and the third of some softer and more flexible material, such as lead, the whole when combined together forming, in external appearance, an egg-shaped shot. The construction and operation of this shot are as follows:—The body of the shot consists of a casting having one end formed into a blunted point similar to the usual conical ball, as seen at A, fig. 1. The opposite end of this body, from a little beyond the middle, tapers off into a tailpiece seen at B, and is also square at the end. Upon each corner of the square the metal is cut away a little, so as to form a projection, shown at *c*, the object of which will be explained further on. About the middle of the body, A, two recesses are formed completely round, as at *e* and *e'*, leaving a projection, *i*, between. Upon these the leaden ring is cast, and the recesses and projection serve to keep it on. This ring is at C, part being shown in section. From the point at *e'* it will be seen that the inner surface is chamfered off, as shown, and leaves a cup-shaped termination.

The second casting consists of a cap

Fig. 1.

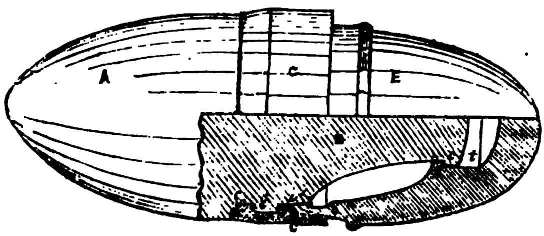
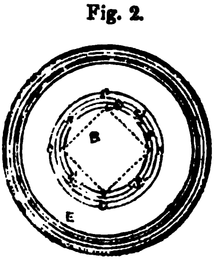


Fig. 2.



which is to enclose the tail-piece, B, and is to effect the expansion of the projecting edge of the leaden ring into the grooves of the cannon. It is shown at E, fig. 1, with a view looking directly into the interior in fig. 2. The rim of this cap is chamfered or bevelled off from the outside, as shown in the sectional part at *o*, where it will be seen to fit in and press upon the like bevelled edge of the leaden ring. In the head of the cap inside is a projecting-ring, *s*, through which four notches, *s'*, are cut, as shown in fig. 2, and these permit the projections, C, to pass through. The object of this will now be made apparent, for by turning the cap slightly round, the projections pass by the notches and become locked by the solid part of the ring, and thus the parts, A and E, are held together. In order that the cap may expand the leaden ring, it must have play upon the tail, B, for which there is room left in the cavity, *t*, beyond. The tail acts also as a guide to the cap, insuring a direct forward motion, since, without such guide, the cap might be driven a little out of the true line, and the result would be, that the ring being more expanded on one side than the other, would cause windage on that other side, and consequently, destroy the accuracy of the fire. The effects in the act of firing are as follows:—The bore of the cannon must be spirally grooved on a principle similar to that of a rifle, and the flat part of the ring, C, should fit the smooth part, or "lands" of the bore. In sending it down, the flexible ring may be slightly expanded by a blow of the rammer as soon as the shot is home. It is in the act of firing, however, that the ring, C, is expanded, so as to take a full impression of the grooves, for by the force with which the cap E is driven towards the body of the shot or A, and before momentum is communicated to the latter, the leaden ring will be expanded, that being the point of least resistance, and be thereby caused to take the impression of the grooves, as also to be packed tightly against the rest of the chamber. This prevents windage, and of course insures the full action of the powder, while at the same time rotary motion is imparted to the shot. The flexible ring also has this important advantage, that it

* This invention, which was accidentally placed among the abstracts of "Provisional Specifications not Proceeded with," on page 308 of our number for September 29 (No. 1677), should have appeared, as was stated in our "Errata" of last week, among the abstracts of "Specifications of Patents recently Filed," as the patent was duly completed.—Ed. M. M.

does not wear or damage the grooves of the gun, even in case of "stripping," should such action occur.

ERRORS OF MECHANICAL ENGINEERS.

In our number for April 21, 1855 (No. 1654), we published a few remarks upon an article which appeared in the March number of the *Journal of the Franklin Institute* on "Errors Committed by Writers on Mechanical Engineering," the writer being Mr. W. Truran. Those remarks have been made the subject of a criticism by the same writer in the September number of that Journal.

As Mr. Truran occasionally writes rather obscurely, we cannot speak with perfect confidence of this second paper; but if we do not misapprehend it, it is, in the main, an admission of the soundness of the reasoning we before employed. He at least certainly seems to admit the fact that two men, applied to two separate and suitably disposed handles of a windlass, may raise a weight greater than double that which one alone could raise; and this was the principal thing for which we contended, and also that which he, in our judgment, disputed.

Mr. Truran objects to our recommending him, as we did, to experiment with a windlass or crane, the handles of which would describe very large circles as they revolved, and considers the suggestion as a proof of our "utter inability to deal fairly with the matter." We assure him that to test a theory by applying it to uncommon, but appropriate circumstances, is an expedient frequently resorted to in scientific investigations, and one, moreover, which is far too serviceable to be altogether dispensed with. We were discussing Desagulier's proposition, in its general form, and were perfectly justified in suggesting the experiment above referred to.

Whether it be a reproach to us or not, it is undoubtedly true, that we have not yet become, and do not even intend to become, recreant to the mathematical sciences, or averse to the application of the principles of those sciences to the problems which arise in the daily experience of engineers. Of this Mr. Truran carefully reminds the readers of the *Franklin Journal*, whether with a sarcastic design or not, we cannot say.

He says, "The London *Mechanics' Magazine* is profuse in its mathematical demonstrations. Here was a fit subject for *displaying its abilities*," &c. This is one of *those damaging sentences* which tend, more than a dozen weak arguments, to lower the character of a writer's observations. Mr. Truran should not have permitted himself to assert that a question which related purely and solely to the application of *muscular action*, was one in which *mathematical* abilities can, in the present state of physiological science, be displayed. He writes on many subjects to good purpose, and it is to be regretted that he should inconsiderately pen that which can have no other effect than that of detracting from his merits as a writer.

Further on Mr. Truran proceeds as follows: "In order further to strengthen his position as an advocate for the gain of power when the cranks are disposed at right angles, the editor takes the liberty of perverting our remarks to suit his peculiar views. He says that the statement of his predecessor was to the effect 'that from two men rightly applied, a greater result may be obtained than from the same two wrongly applied.' Now the extract we gave from Mr. Robertson's letter was copied literally, and nowhere contains the saving clause 'wrongly.'" Of course! No one doubts that the letter was copied literally; but, at the same time, no one doubts that the remark was "to the effect" above stated.

To Mr. Truran's suggestion respecting "the laxity which even editors sometimes exhibit in *private* correspondence," we need only reply, that from his former paper we understood that the opinion quoted from the letter of our predecessor was offered privately, and not professionally.

We need only add that the solicitude for the character of the *Journal of the Franklin Institute* manifested in our former article was real, and that the tribute of admiration offered to it was, as we still believe, most certainly deserved.

SCREW PROPULSION:

EFFECTS OF SCREW PROPELLERS, WHEN MOVED AT DIFFERENT VELOCITIES AND DEPTHS.

BY GEORGE RENNIE, C.E., F.R.S.*

THE form and action of screw propellers, as applied to steam navigation, have occupied the attention of engineers and theorists ever since the first introduction by Smith and Ericsson in 1837. Their investigations have been confined, however, to their actions in moderate velocities and depths. The difficulty of arriving at a true theory is greatly increased in consequence of the very complicated elements which enter into the question, and which can only be determined by experiment of these elements. The re-

* British Association, 1855.

sistance and friction of the screw against the water at different velocities; the imperfect form of the blades of the screw when propelling the vessel under the different circumstances of velocity and resistance; and the form of the vessel itself to produce the smallest possible resistance under the variable circumstances of wind and weather, are elements which no theory can ever elucidate until these elements or coefficients are accurately ascertained. The experiments which have been made in England, France, and America, have been confined to ascertaining the best form of propeller, and the dynamometrical resistance it is capable of exerting when propelling vessels through the water; but no experiments, so far as we have been able to learn, have been made upon the resistances to propellers at different velocities and depths. The importance of modifying practically the many objections which exist in the use of propellers of large dimensions and weight, as applied to the sterns of vessels, can be best appreciated by those who have experienced the violent shocks, and danger to the vessel and engines during the plunging of the vessel in rough weather, arising from the unavoidable weakness of the stern-post, against which the screw acts. The tendency of the engines to run away when relieved of the resistance of the screw when out of water, and when the diameter of these screw propellers often exceeds 16 feet, and the weight 8 tons being considered, it will be seen how desirable it is to reduce these dimensions and weight. It is to obviate these inconveniences that the experiments now produced were undertaken. Hitherto the practice has been to drive the screw by means of multiplying gear and low-pressure engines, as was the case with the *Archimedes*, *Rattler*, and other vessels. The inconveniences were felt in the tremor and rumbling noise produced. In dispensing with these inconveniences, direct-actioned engines, or engines acting directly upon the screw, were introduced; and which again necessitated the use of steam of a higher pressure, up to 22 lbs. per square inch, and a screw propeller of the largest possible diameter and pitch. From this arrangement, velocities have been obtained of from 10 to 14 knots per hour, and the experiments which were made by H. M. steamer *Dwarf* were the first which produced a speed of 10 knots per hour. It is, however, obvious that the use of low-pressure steam, either by gearing or direct action, is subject to many inconveniences; and when engines of large power and great weight are worked at velocities exceeding 60 or 70 revolutions per minute, the dangers from condensed water and fracture are great. We are, therefore, driven, according to the present practice, either to the substitution of high for low-pressure engines, or to the use of two screw propellers, one on either quarter of the stern-post (as patented by Captain Carpenter), or to seek some other mode which shall meet the above objections. The experiments will show how far this can be effected:

Experiments made by Mr. Joseph Apsey at his works, Broadwall, Lambeth, in May and September last, under the direction of Mr. G. Rennie, on the effects produced by a Screw Propeller when revolving in a tank of water at different velocities and depths.

Dimensions of Screw.—Length or pitch 14 inches; diameter, 13⅜ inches; area, in square inches, 140¼. The water was lowered from 3 feet above the top of the screw to 2 feet 1 inch, and level with the top of the screw, and the velocities were given to the screw by means of a steam engine, and multiplying pulleys driven by straps at the rates of 920 and 460 revolutions, respectively. Two experiments were made in each depth of water.

The following are the results—

Number of Revolutions per Minute—920.	Height of water above screw.	Pounds Weight raised.	Number of Revolutions—460. Difference.	Pounds less Weight.
Experiment 1.	3ft.	448		126 or 3·59
			1·28	
„ 2.	2ft.	350		112 „ 3·
			1·27	
„ 3.	1ft.	299		88 „ 3·7
			4·46	
„ 4.—Level with top of screw		67		63

These experiments were made under Mr. Rennie's direction, in May last, and were undertaken a second time a few days ago, which verified those made previously.

Now, according to a series of experiments made at H. M. dockyard at Woolwich, with Professor Collodon (of Geneva), with the dynamometer under the direction of Mr. Lloyd, chief engineer of the Steam Marine Department of the Navy, the mean pressure of the various screws of H. M. ship *Rattler*, when moving the vessel at from 9 to 10 knots per hour, was about 3 tons, or 6,720 lbs. which, divided by the area of the

screw, taken as a whole disc, would give a pressure against the water and the vessel about 86 lbs. per square foot, whereas the pressure per square foot shown in the highest velocity of 920 revolutions of Mr. Apsey's screw, of 13½ diameter, 140 inches area, under one square foot, was 448 lbs., or five times greater per square foot than the pressure against the *Rattler*. If this be true, it follows that a screw having only one-fifth of the area, or 15·6 square feet, say 4 feet diameter working in direct action, of the *Rattler's* screw, and driven at a high rate of speed, will be equally effective as the ponderous screw of the *Rattler*. If, therefore, the speed of an engine can be safely increased, so as to give increased velocity to the screw, a vast improvement will be effected in screw propulsion. Now the disc engine is peculiarly adapted to give high speed to screw propellers, as it can safely be worked up to 500 and 600 revolutions per minute, and the experiments which have been made by Mr. Rennie during the last two years upon this engine show it to be peculiarly adapted to the screw.

Mr. Appold and several members expressed their conviction that if the screw were just deep enough to have its action weakened by the air that was mingled with the water on agitation, any greater immersion would increase its efficacy very little.

Sir E. Belcher, five years ago, saw the disc engine in action at the *Times* office; the objection then raised was that the engine could not be reversed quickly. He was satisfied that all the fans in our engines are too heavy. He attended the meeting of the Association at Swansea, and came back with a steamer that had her fan broken; the engineer placed a piece of shovel on the fan broken, and the vessel went faster than before.

A member thought we were too much afraid to employ large screws. Small screws were only useful for canal and river steamers. There was a great difference between small and large vessels.

Mr. Rennie replied that the disc engine could be reversed more easily than the reciprocating engine.

IMPROVED PORTABLE COPYING PRESS.

Messrs. S. Mordan and Company are now issuing an improved portable apparatus for copying letters, &c., which was recently patented by Mr. Terry, of Adelphi-terrace. The object of the invention was to combine with the covers of a book a suitable apparatus in such manner that the act of closing the covers should be the means of copying documents inserted between the leaves of the book. The invention is carried out by affixing to the outside of each of the covers a rigid metallic frame, that on one cover carrying an inclined projecting piece at each end, and that on the other having hinged to each end of it one or two links which, when the book is closed, are pressed by hand over the inclined projecting pieces, so as to tightly compress the leaves of the book, and hold them in a compressed state as long as is desirable. Each of the frames is composed of one thin longitudinal plate, crossed by three transverse plates of the same thickness, the necessary strength and rigidity being supplied by means of ribs formed upon the plates.

From the above description the construction of the apparatus will be readily understood. Its utility, as a very simple and convenient copying press, needs no comment.

NEW THEORIES OF LIGHT AND HEAT.

(*Continued from page* 327.)

I have already said that all light is, and must always be, the result of combustion, meaning by combustion the conversion of inflammable matter into flame: and I now say that all light is positive flame, either primary or secondary. By primary flame I mean a flame in which the conflict of combustion is actually going on; by secondary flame, I mean minute particles of flame which are driven off in straight lines during the conflict of combustion. Each particle of light is as positively flame as the parent source was from which it emanated, and it may be condensed by refracting it through a convex lens; indeed, by this means, what is called solar light may be condensed until it becomes more vivid in appearance, and more powerful in action than any flame we can produce by artificial means, for it will melt substances that cannot be melted by artificial flame.

I shall now endeavour to prove that combustion is going on in the earth's atmosphere to produce the light which clothes it.

I have already said that all light is and must be the result of combustion, and that light cannot be produced without combustion. If this be admitted, it will follow that if we have a certain quantity of light, and require more, we can only obtain it by increasing the combustion which supplies it. If this ground of argument be considered fair and sound, it will follow that as the tops of high mountains are clothed with much less light than the base thereof, increasing combustion must be going on in order to

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produce the increasing quantity of light which is found to exist as we descend.

Again, if strong solar light, as it is called, be allowed to fall on a domestic fire, the fire will go out, because the combustion necessarily going on in the earth's atmosphere, to produce what is called solar light, requires oxygen gas for its support, and takes it up accordingly, leaving for the fire a diminished supply.

Again, if what is called solar light be condensed through a convex lens, it will set up combustion in every description of inflammable matter; consequently, it must be in a state of combustion itself: and if every description of inflammable matter can be ignited by conveying condensed solar light, as it is called, to it, it is only fair to infer that the very light and easily-ignited gases existing in the atmosphere may also be ignited by it, in a natural way, during its downward passage towards the earth.

If phosphoretted hydrogen gas be produced in a large quantity, it will undergo spontaneous combustion on coming in contact with the oxygen gas in the atmosphere; but when produced in small quantities, combustion does not take place. This gas is given off by all water and other matter constituting the surface of the earth. Occasionally it is produced in a sufficient quantity to undergo spontaneous combustion immediately over the earth's surface, as in the case of the *ignis fatuus;* but generally the quantity is insufficient for that purpose, in which case, in consequence of its less specific gravity (it being only about one-tenth the weight of atmospheric air, bulk for bulk), it rushes up through the atmosphere, until it arrives at the highest regions thereof, where it forms and collects in sufficient quantities for spontaneous combustion, and from floating on and being in connection with the heavier gases, oxygen being one of them, the lower part of the volume of hydrogen gas is in contact therewith, and undergoes spontaneous combustion in consequence of such contact, and forms that beautiful blue flame commonly called "blue sky," which exists night and day, and probably has existed since "God said, Let there be light, and there was light," forming also the source of all the light our earth receives, be that light what is called solar, lunar, or stellar. But beneath this source of light produced by the combustion of hydrogen gas in the highest regions of the atmosphere, there exists an immense quantity of nitrogen, oxygen, and other gases, effluvia, and aqueous vapour, given off by the ocean and every description of matter on the earth's surface, and these constitute the atmosphere which surrounds it. To supply the necessary ingredients for this atmosphere, all fluid and solid matter on the earth's surface contribute their share; but in the supply of perfect gas a process is going on in nature which I have never seen or heard described. I shall, therefore, take this opportunity of explaining it.

I have already said that the atmosphere consists of gases, effluvia, and aqueous vapour; and I wish it to be distinctly understood that there is a marked difference between these descriptions of matter. Gases differ from aqueous vapour and effluvia, inasmuch as they cannot be condensed or reduced to the fluid or solid states by any degree of cold, however intense; whereas effluvia and aqueous vapour can be reduced by extracting the sensible heat from them which was necessary to their formation, as in the case of steam, &c., which may be heated to any possible degree, still remaining steam, and may be reduced to water again at any time by simply extracting the heat from it. But neither water nor steam can be decomposed into the two gases which constitute it, viz., oxygen and hydrogen, by sensible heat only; therefore another process is going on very generally throughout nature, to which I apply the name of *digestion.* By digestion I mean the separation of the component parts of matter; hence, as water is composed of two gases—oxygen and hydrogen—any process that will decompose or digest water into the gases which compose it, I include in the term digestion. Animals and vegetables are known to be capable of digesting water; indeed they cannot live without it; but when they digest it, and take one of its parts, to become fixed in them as part of themselves, they must release the other part, which then becomes free and enters the atmosphere as gas, &c. Animals and vegetables take hydrogen from the water, which becomes fixed in them as fat, oil, wood, &c., but in each case the oxygen is set free from the water, and escapes into the atmosphere as oxygen; and thus by means of animals and vegetables the atmosphere is supplied with a very considerable portion of oxygen. A similar process is also going on in inanimate matter. Thus, iron is capable of digesting water, and taking its oxygen from it, while oxygen then becomes fixed in and part of itself, as oxide of iron, or iron rust; but in doing so it must release the other constituent part of water, that is, hydrogen, which then escapes into the atmosphere as hydrogen gas; and as animals cannot digest gas, so neither can iron; for iron may remain in pure oxygen gas for ever without undergoing change, unless the oxygen gas is being reduced by combustion, when it no longer remains as oxygen gas; but if iron

is allowed to communicate with water or aqueous vapour, it digests the oxygen therefrom and releases the hydrogen; and in this way as oxide of iron, or any other oxide, is produced from water or aqueous vapour, hydrogen gas must be released; and *vice versâ*, as hydrates are produced from water or aqueous vapour, so oxygen gas must be generated.

But although much gas is generated in this way by animals, vegetables, &c., on the earth's surface, the principal supply is produced in the atmosphere itself. The manner in which this is done I cannot better explain than by comparing it to the process usually employed in making hydrogen gas. To make or obtain hydrogen gas, steam or aqueous vapour is arranged to pass over iron while in a heated state, when the iron attracts and digests the oxygen from the aqueous vapour, which oxygen associates with it as oxide of iron, and releases the hydrogen which escapes or may be collected as pure hydrogen gas; and it is found that the process goes on very much faster if the iron be reduced to fine chips or filings, than it would do were it in one piece; the process is also found to proceed more rapidly in proportion as sensible heat is applied. Now, a similar process is going on, more or less rapidly according to the degree of sensible heat, in every part of the lower regions of the atmosphere which is found to contain immense quantities of every description of matter in the form of effluvia (by effluvia I mean solid matter divided into very minute parts, similar to the iron filings, only infinitesimally smaller.) The atmosphere is also found to contain an immense quantity of aqueous vapour, and the effluvia and aqueous vapour being always in contact, the same as the steam and iron filings, just described, some of the effluvia attracts and digests oxygen from the aqueous vapour, and releases hydrogen, which then escapes; while other descriptions of effluvia attract and digest hydrogen from the aqueous vapour and release oxygen. In this way oxides and hydrates are continually being formed in the atmosphere, and descend upon the earth, film after film, till in the process of time they form strata, while the gas, so generated, serves to supply the atmosphere with the materials for the combustion necessary to produce all the light required. I would further observe, that hydrogen gas may be released by means of sensible heat from those substances which have digested it from water, and afterwards held it in a fixed state, as oils and fat of every description; also from resins, wood, coals, &c.; but such substances must first obtain it from water *by the process of digestion*, as already described, and after it has been so obtained, it may be set free as hydrogen gas, by means of sensible heat only.

I would next allude to the fact, that pure oxygen and hydrogen gases, when undergoing combustion by themselves, produce a blue flame which gives off very little light; but if such gases are supplied with small particles of solid matter in the form of effluvia during their combustion, the flame changes in colour from blue to white, and the intensity of the light given off increases in proportion to the quantity of effluvia supplied. This will account for the great difference of light produced by the combustion going on in the different altitudes of the atmosphere.

Nearest the earth's surface, the quantity of effluvia contained in the atmosphere is greatest, and so is the intensity of the light produced. As we ascend through the air there is less and less effluvia, and less and less light in the same proportion, until we reach those regions where effluvia ceases to exist, and there is found that beautiful blue flame produced by the combustion of pure gases, which from their less specific gravity alone ascend in those regions.

I come now to notice the influence of the sun and other heavenly bodies on the combustion which produces the different descriptions of light which clothe our earth, viz., solar, lunar, and stellar.

There are two actions going on in nature, viz., mechanical action and chemical action. Mechanical action may be defined as the action of matter on matter, and it is confined to the formation, motion, and position of matter, including cohesion and attraction, and embraces that power or influence, which Sir Isaac Newton discovered and explained under the name of "Gravitation." Gravitating power would appear to be communicated from one heavenly body to another by sympathy, without a material connexion, because the material extent of each world is bounded by the atmosphere which surrounds it, and such atmosphere is known to extend but a very limited distance from its surface; and it is also known that action and reaction, in the gravitation between heavenly bodies, are always equal. That gravitation is purely mechanical and does not in any way chemically affect matter, is indicated by the influence of the moon, &c., in causing the tides; for the water constituting them does not undergo any chemical change; it is simply drawn up and descends again mechanically.

Chemical action may be defined as the action of fire or heat on matter, by means of which its state becomes altered from the solid to the fluid and from the fluid to the vaporous, and *vice versâ*; it also affects the

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nature and properties of matter without altering its state; that is, solid matter may undergo a chemical change and still remain solid matter, and the same with fluid and vaporous matter; and, as mechanical action is known to produce communication between heavenly bodies by sympathy, and as Sir Isaac Newton has distinguished the sympathetic mechanical influence which exists between worlds under the name of GRAVITATION, so I have taken upon myself to distinguish the chemical sympathetic influence, which I am endeavouring to prove exists between worlds, under the name of IGNIPOTENT ACTION.

But, before I go further, I wish to draw a line of distinction. All action, whether mechanical or chemical, which is confined to the surface of the earth, or the atmosphere which surrounds it, I wish to distinguish as "Local Action;" whereas, all the action which takes place between heavenly bodies, whether mechanical or chemical, I wish to distinguish as "General Action," and, whenever I use the term "Ignipotent Action," I wish it to be understood as applying to that general sympathetic chemical action which exists between heavenly bodies throughout creation.

If the existence of mechanical and chemical actions between heavenly bodies is admitted, and if it also be granted that these two actions are governed by similar laws, that is, that action and reaction are equal in both cases, that their influences are communicated from one heavenly body to another by sympathy, and that such influences decrease in both cases according to the square of their distances from each other, it will follow that if the sun exerts a chemical sympathetic influence upon the atmosphere of the earth, or any other heavenly body, so as to effect an increase in the combustion going on over its surface, that the earth or other heavenly body will re-exert such influence back upon the surface of the sun, so as to affect the combustion going on in its atmosphere with a force or power exactly equal to that which they receive; and as the sun is the centre of the solar system, and surrounded by planets, each of which is receiving its "ignipotent" influence, and reflecting it back again upon him, such reaction must cause the whole surface of the sun to be clothed with an equal quantity of light, or nearly so. The sun being the centre of the solar system, and only able to exert "ignipotent" influence on the planets by means of the spontaneous combustion going on over its surface, it will follow that the planets cannot possess the same intensity of light as it possesses, because the "ignipotent" influence they receive depends upon the square of the distance they are from it, and as they react "ignipotently" upon the sun, with as much force as that with which they are acted upon, such reaction serves to increase the intensity of the original light over the surface of the sun. Hence it is more brilliantly illuminated than any of the planets can possibly be, and its illumination covers its entire surface equally, or nearly so; whereas, the original spontaneous combustion which takes place in the atmosphere over the earth's surface, from being sometimes affected by the "ignipotent" influence of the sun, at other times by the "ignipotent" influence of the moon, and then by the "ignipotent" influence of the stars, varies considerably. And it is the same with the planets and satellites generally, and with all the other systems throughout creation.

As the combustion which produces the different descriptions of light is affected by a direct "ignipotent" influence from one heavenly body on another, so the rays of light must be formed in the direction in which the "ignipotent" influences act; consequently, these rays would appear to come from the heavenly body, under whose "ignipotent" influence they are affected. Hence the mistake in supposing that light is transmitted from one heavenly body to another. Take our earth as an example. Spontaneous combustion is always going on at the base of the stratum of hydrogen gas, which, from its less specific gravity, floats over the heavier gases, and probably constitutes the highest regions of our atmosphere. The flame is produced at that particular line of junction where the heavier gas, oxygen, supports the lighter, hydrogen. This flame (or blue sky) exists all round the upper stratum of the earth's atmosphere, and as one-half thereof must always be facing the sun, so the "ignipotent" influence of the sun affects it, and causes combustion to descend through the atmosphere, at the same time producing gaseous fuel to feed the same from the effluvia and vapour which are known to exist in the air, and in this way that ocean of flame is produced which we call sunshine, or daylight; and by these means the atmosphere is cleared of all the noxious effluvia, &c., which would otherwise prove fatal to animal and vegetable existences. Under the "ignipotent" influence of the moon a similar process goes on only in a less degree of intensity, and so also with the stars, each visible star possessing more or less "ignipotent" power, according to its size and relative position with regard to our earth.

Many persons may be doubtful of the truth of the theory I am advocating, because they may not be able to form an idea of combustion without such intense heat as is

found to be produced by our ordinary fires, candles, gas-lamps, &c. I will, therefore, call attention to the fact that combustion does exist in a natural way without such heat, as in the case of the glow-worm, *ignes fatui*, fire-fly, &c. In these, no sensible heat can be detected above the common temperature, because, as I have said before, the sensible heat produced by combustion will always depend upon the quantity of latent heat contained in the materials which are reduced by combustion, no new heat being created. For when we talk of generating heat, it ought to be understood that we only release fixed or latent heat, and render it free or sensible by combustion: and as in Nature no great degree of sensible heat is supplied to produce the gaseous fuel necessary to feed and support the flame of day, so no great intensity of heat ought to be expected from the combustion of such materials.

I cannot conclude this part of my subject without giving an extract from Dr. Dick's very popular writings. He says, in speaking of our atmosphere, that "If the nitrogen were extracted from the air, and the whole atmosphere contained nothing but oxygen, or vital air, combustion would not proceed in that gradual manner which it now does, but with the most dreadful and irresistible rapidity. Not only would wood and coals, and other substances now used for fuel, but even stones, iron, and other metallic substances, would blaze with a rapidity which would carry destruction through the whole expanse of Nature."

From this it is evidently the opinion of Dr. Dick, that if nitrogen gas were extracted from the atmosphere, the whole world would be in a violent state of combustion and general conflagration. This opinion of Dr. Dick's can be fully sustained by experiment, and it must be equally obvious that were oxygen gas to be extracted from the atmosphere, we could neither have combustion or animal life; so that, in either case, certain destruction would inevitably ensue.

This brings before us the remarkable fact that the powers which support and destroy combustion exist in the atmosphere in equilibrio, or nearly so; for while oxygen gas is found there always ready to support it, nitrogen is also found there ready to destroy the powers of it. These two gases, by acting equally and opposite, endeavour to neutralize each other, and produce a state of equilibrium. But as the disposing powers of oxygen gas to produce combustion come under the sympathetic "ignipotent" influence of the sun, the equilibrium is destroyed, the oxygen gas, the great supporter of combustion, obtains assistance, and gains the ascendancy; combustion becomes accelerated, and an ocean of flame is produced from the combustible matter over the earth, exactly where the flame is wanted; and a high tide from this flame always faces the sun, in a similar way as the high tide from the ocean of waters always faces the moon. As the earth revolves within this concave ocean of flame, it carries its atmosphere with it, and thus a supply of fuel, in the form of inflammable gas, rushes in to feed this flame at the rate of more than a thousand miles an hour at the equator, where the fire is the strongest, and with gradually less speed towards the poles, where the blaze is weakest.

As the "ignipotent" influence of the sun becomes lost to any part of our earth, whether during an eclipse or otherwise, equilibrium would become restored, were it not for spontaneous combustion and the "ignipotent" influences of the moon and stars, which, by always assisting the power of the oxygen gas, keep up constant combustion, although varying in degree, and prevent that perfect equilibrium which would destroy all light, and render our earth entirely dark. This view corresponds with that general disposition towards equilibrium which is manifested throughout nature. I say a disposition towards equilibrium; for in the great constitution of nature perfect equilibrium never takes place. If it did, all action would cease, and destruction would be the consequence. As it is, all the water over the earth's surface is constantly in motion, trying to find its level, or that state of equilibrium which it never finds. All the gases in our atmosphere are constantly in motion in currents of wind striving to find that state of equilibrium which they never find. The sun and our earth are constantly pulling each other by the lines of gravitation, and at the same time counteracting this attraction by trying to roll away from each other, in consequence of the centrifugal force produced by their diurnal motions; and by each of these forces alternately gaining the advantage, a state of constant and regular activity is kept up; and it is the same with all nature, which is in perpetual motion, and never at rest, because there is no such state as perfect equilibrium allowed by the great Author of all things, although all appear to be striving for it.

(To be concluded in our next.)

THE PROJECTILE CONTROVERSY.

LAWS OF MOTION—SOLAR REFRACTION —SIR ISAAC NEWTON VINDICATED.

To the Editor of the Mechanics' Magazine.

SIR,—Your correspondent, "Maximus," seems fairly at sea in the algebra of the

projectile problem, and is consequently obliged to form what notions he can from a mere inspection of the figure. I must, therefore, state for his information, that if bodies describe spaces *proportional* to the times when the times are unequal (as they were taken in my figure), they will necessarily describe equal spaces in equal times. I have never seen any standard elementary work on mechanics in which the theory of a projectile *in vacuo* differs materially from that given in my last letter; there is no reconciliation, therefore, needed between me and such writers. That which your correspondent facetiously calls the "parallelogram of the received doctrine," does not show equal spaces in equal times; but that the spaces which would be described, were gravity not to act, would be equal in equal times. Moreover, "according to me," if gravitation were removed, the body would not describe *unequal* spaces in equal times; and consequently I do not allow the evanescent nature of the so called "propelling force."

I regret to find that Mr. Mushet has been venting his indignation against astronomers for their supposed blind adherence to palpable errors, all the time that he is, according to his own confession, unacquainted with the details of astronomical science; behind which comfortable ignorance he shields himself when convicted of error. A pretty way this of conducting a "controversy!" However, the unbounded confidence he places in Mr. Hopkins, whose wonderful accuracy in other matters he has tested, may be some apology, if not excuse.

After this candid, though tardy confession, it will be vain for Mr. Mushet to pretend to be of "no school."

Nullius juratus in verba magistri.

Nor is it remarkable, considering the unbounded confidence Mr. Mushet places in Mr. Hopkins, that the latter gentleman should *reciprocate*. I am not, therefore, surprised to learn, notwithstanding the utter demolition by me of everything intelligible in Mr. Mushet's letter, in Number 1675, that that "masterly" production remains unanswered. The tone of Mr. Mushet's last letter, however, indicates a very different opinion on the part of that gentleman himself. It is, moreover, satisfactory to find that Mr. Hopkins only *ignores* my arguments, and does not attempt to answer them, which relieves me of considerable trouble.

There is very little in Mr. Mushet's last letter that requires notice.

Mathematical theories of physical subjects are, as he correctly states that we assert, founded on observation. He is only in error in saying that this is a late claim on the part of mathematicians. I greatly fear that he is little acquainted either with the theories themselves, which he impugns, or the observations on which they are based, especially as he is so ready in discovering unworthy motives on the part of mathematicians in maintaining them. I can fearlessly assert that no set of men in existence are so little wedded to established systems, *because* they are established, as the present race of mathematical philosophers; and the "unavoidable tendency of the human mind, when strongly and perseveringly enlisted in defence of a system, to shut out and disregard even the most startling facts when they are in collision with it," as intended to apply to this class, is a mere phantom of Mr. Mushet's prolific brain. There are personal imputations which it is very easy to make, and no doubt have a certain weight with some minds. It is doubtless very flattering to self-love (however abhorrent to truth) to persuade ourselves that we alone pursue truth, without favour or prejudice, purely for her own sake. Mr. Mushet is very welcome to the comfort he seems to derive from this reflection, which, after all, is more convincing to the individual who fosters it than to his opponents. For our part, we set up no *exclusive* claim to purity of aim and intention.

The only part of the letter I am now discussing, which has any bearing on the subject in dispute, is contained in the last two paragraphs, which state that "the recognized laws of composition and resolution of forces, and the alleged first law of motion," flatly contradict each other.

I certainly was prepared to hear something alleged against the first law of motion, for this seems to be the favourite topic of the practical school; but I never could have anticipated so extraordinary an allegation as this. I cannot even form a conception *how* these laws *can* contradict each other. Probably, however, as in the case of limits, we shall hereafter be told that we are to understand this dictum only to the proper extent, that is, as far it is "meant" to be understood.

The first law of motion resolves a question which *must* receive some solution before the laws of composition and resolution of forces can be applied to the case of a body *in motion*. A body already in motion is under the action of certain forces. How will it move subsequently? If it were *at rest* we know that it would begin to move in the direction, and with an amount of motion proportional to the magnitude of the resultant of the impressed forces. The first law of motion asserts that were there no impressed forces the body would continue to move uniformly in a straight line. The second law tells us that the *change* of mo-

tion is the same as if the body had been at rest. So far, therefore, from contradicting each other, the laws of composition and resolution of forces and the two laws of motion, enable us to reduce all cases of motion to direct calculation. These two laws just supply the link that is necessary for connecting the actual motion of a body already moving with the laws of composition and resolution of forces. The first law of motion might have been other than it is. It might, for instance, had observation and experiment warranted, have asserted that when a body is in motion under the action of no forces, it will move with a continually decreasing velocity, as Mr. Hopkins asserts. But in any case there is and can be no such *contradiction* as Mr. Mushet states. As I have already said, the question set at rest in our first law *must* receive some solution *before* the laws of composition and resolution of forces can be applied. The only question is, what warrant is there that the first law of motion is a truthful exponent of physical facts?

Now, the experiments and observations on which it is based are fully set forth in all sound elementary works on mechanical science; and to repeat them here would be uselessly to consume your valuable space—they are already within the reach of every one who chooses to search for them: and the least we can fairly expect from opponents is, that they should possess an acquaintance with them, and be prepared with arguments to prove their incorrectness, and with counter experiments and observations on which their new laws are to be based. Mr. Hopkins does not put the question fairly, when he says that if we ask for the grounds of his theories, he has a right to ask for the foundations of ours. These latter are patent and public, and he has as ready an access to them as ourselves. They have hitherto been held satisfactory in the scientific world. If he wishes to gain credence to his new opinions, *his first step* must be to *disprove* the old and *prove* the correctness of the new views. Of assertion we have had enough and to spare—what we want is proof.

So with regard to Mr. Hopkins's tropical observations. The question is not put fairly by Mr. Mushet, when he asks me to produce a set of tropical observations antagonistic to Mr. Hopkins's. The issue lies not between Mr. Hopkins and me, but between Mr. Hopkins and the whole race of astronomers. The latter apply a certain correction for *refraction*, of which they make no secret or mystery, to every observation; and, amongst others, to the determination of the sun's apparent diameter. It is for Mr. Hopkins to do the same. When he has given an *intelligible* account of his mode of proceeding, and the reasons for it, then the issue between him and the astronomers will be fairly raised. This brings me to his paper on "The Optical Illusions of the Atmospheric Lens," said to have been read before the British Association. By-the-bye, can any one inform us how many men of scientific eminence were present at the reading of this paper, or at least sat it out?

Mr. Hopkins says he found it necessary to prepare a table of refractions founded on direct observations. How and on what principle? If his law were true, the sun's apparent diameter would always, in every latitude, be of the same magnitude at the *same altitude*. This is in contradiction to the observations—most careful and accurate observations, let me say—of our most experienced observers, and made with the most splendid instruments. There can be no intelligible reason why Mr. Hopkins's law should be true at the equator, but untrue in the latitude of Greenwich.

We have nothing to do with Captain Smith, of the Futtel Oheb, no doubt a highly respectable member of the respectable family of Smiths; but whose simplicity, for aught we know, may be on a par with his respectability. We want *arguments* in support of Mr. Hopkins's notions. I proceed to quote the paragraphs which are presented to us in lieu of argument, and I take the liberty of italicising those sentences which appear to be *Mushetice* metaphysical—*Anglicé* unintelligible:

"As the sun describes its apparent daily path in twenty-four hours, it follows, as a necessary consequence, that its real position at six in the morning and six in the evening must be in a line drawn through the centre of the earth. But the refractive powers of the surrounding atmosphere *cause the sun to appear in our horizon* DIAMETRICALLY OPPOSITE *at the same instant of time; that is, one-half of its diameter in one horizon and one-half in the opposite horizon, precisely at six. Thus we find that the diameter (?) of the atmosphere is so adjusted as to neutralize the intervening diameter of the earth altogether. Hence* we have a complete semicircle of the sun's apparent path above the equatorial diameter."

I cannot form a conception of the existence of *two opposite horizons*. Mr. Hopkins's definition of horizon must differ greatly from that received in astronomy to permit of such language. And this is the explanation on which is founded a new series of observations corrective of the old!

Mr. Hopkins treats as a *myth*—a fable invented by astronomers to bolster up the false theory of the elliptic motion of the

[redacted]

earth—the *fact* that the "southern hemisphere is less favoured by the sun than the northern, to the amount of 7 days 16 hours, and 50 seconds." But facts are stubborn things, and astronomers have made this computation by observing the exact time in which the sun is in the equator; that is, when his declination is zero at the two equinoxes. Unless, therefore, Mr. Hopkins can prove that this too is an optical illusion of the atmospheric lens, his simple denial of the fact will profit him little. The first observation of this fact, by-the-bye, is due to a period long antecedent to that in which astronomers had to make their observations square with the Newtonian philosophy.

I now come to Mr. Hopkins's own letter in No. 1677, and the wonderful parallelogram in No. 1669, page 107, which is to account for everything.

But here we are met with several difficulties, which, in the extreme paucity of words and brevity of explanation, which seems a characteristic of the new practical school, it is impossible to surmount. What, I may ask, is the *radial attraction* spoken of, and in what direction does it act?

I have formerly shown that the "propelling force" has ceased to act as a force when the projected body has got beyond the region of its *material influence*, and it has succeeded in expelling the body with a certain amount of velocity. Now it is simply impossible for a velocity and a force ever to be in equilibrium, even though the former be of an "evanescent nature."

Messrs. Hopkins and Co. have raised a great outcry against Sir John Herschel because, in an *illustrative projectile*, he has neglected the resistance of the air. Mr. Hopkins, in his "true parallelograms," makes the same oversight; at least he never mentions the resistance of the air at all.

Mr. Hopkins speaks as if he has given a *mathematical* demonstration of his new principle. His whole statement appears to me most vague, loose, and indefinite, as far removed from the *accuracy* of mathematical demonstration as it is possible to conceive anything to be.

Where are the conclusive experiments and accurate observations on which he founds his theory? Where the intelligible law expressed in symbols which is the exponent of this theory? The latter exists nowhere; the former are reduced to that most valuable experiment of "throwing up a ball." And are this and the vague admeasurements by the eye of its path all that Mr. Hopkins has to offer us in exchange for the accurate experiments of mathematicians? Truly I fear everything that we should prove by adopting his advice and making this experiment for ourselves would be—our own simplicity.

And now let us come to Mr. Hopkins's "*alter ego*," "Civil Engineer."

This gentleman professes a high regard to mathematics, which, however, seems to be confined to words, as he nowhere condescends to mathematical reasonings or symbols. "*But* he must have physical data for all theories, even when assumed by great mathematicians." Let him point out one single theory received in the scientific world which is *not* based on physical data? I promise him that I for one, and I am sure all genuine mathematicians, will discard it at once. Truly this school can have but a scanty acquaintance with the labours of mathematicians, or they would not rashly hazard such assertions and insinuations that mathematical theories are not based on physical data. All that they really call on us to do (although they seem quite unconscious of this), is to substitute one set of physical data for another. Let them only establish theirs on a sounder foundation of reason, observation, and experiment than ours, and we will admit them at once. Till this is done (and nothing of the kind has been attempted yet), we cannot help regarding all this outcry about physical data as so much moonshine.

Of "Civil Engineer's" qualifications to correct mathematicians on the article of physical data, we have a notable instance when he says, "According to the laws of terrestrial physics, the *space described* is an exact measure of the *power consumed*."

Will he condescend to inform us *whence* he obtained this precious law?

That which is sometimes called labouring force, and sometimes work, which he evidently means by power consumed, is *exactly measured* by the product of the force applied *and the space described by it*. So that if U be the work, P the power or force applied in lbs., and V the number of feet through which it is moved, $U=PV$. According to "Civil Engineer," $U=V'$.

It is very true that we have no experience of motion in free space, because the earth is everywhere surrounded by a medium whose resistance alone (were no other force to act) would in time reduce every body to rest. But I will give one illustration, among many which might be found, to "Civil Engineer" and Mr. Hopkins (who asks proof in your last number) of a body moving uniformly under conditions which are strictly analogous to the case of *no force acting*.

I will only ask them to allow (according to the laws of composition and resolution of forces in which they profess a belief), that if one force be equal and opposite to the sum of two others, the resultant of the whole three is zero, and they may be supposed to be removed without affecting the body's state of rest or motion.

When a railway train has acquired such a velocity that the mean thrust exerted by the engine to propel the train is exactly equal and opposite to the friction of the wheels, together with the resistance of the air, it is an *experimental fact* that the railway train moves *uniformly* with this velocity.

But this is a case in which the resultant of the forces applied is zero. According to our first law of motion, it *ought* to move uniformly; according to experiment (made thousands of times every day), it *does* move uniformly. Were any law but the first law true—that is, were there a tendency in a body to retard its own motion, *then*, under the circumstances supposed, the motion of the railway train *could not* be uniform. Here is a case for our engineering philosophers to expend a little of their ingenuity upon!

"Civil Engineer," in order to fortify his arbitrary position with respect to the arbitrary nature of the supposition of great mathematicians, instances several cases in which he tells us that Newton's doctrines have been superseded since his day. But surely such instances, so far as they are true (of which we shall say more anon) prove the exact contrary to that which he would have us infer. They show incontestably that mathematicians are not to be dazzled by any name, however great; but calmly, resolutely, and unflinchingly pursue truth for its own sake, even though they should thereby be called upon to sacrifice the theories of men whom they justly regard with the highest veneration. "Civil Engineer," however, by an ingenious process, for which he cannot be too highly commended, has multiplied *three* independent cases which he instances so as to seem more. These three cases are—1st. The modern theory, that all space is permeated by an ethereal medium, which Newton did not adopt; 2nd. The now general adoption of the undulatory theory of light, instead of Newton's corpuscular theory; and 3. The substitution of Leibnitz's differential calculus for Newton's method of fluxions. I need not tell any of your readers who are at all acquainted with physics, that Huygen's law of double refraction and Hooke's theory of inflection are nothing more than the undulatory theory applied to the explanation of these phenomena: and, of course, if Newton's corpuscular theory be rejected for the undulatory theory of light, Huygen's and Hooke's investigations, as forming part of the latter, must be included in it.

Now, as regards the resisting medium permeating space. Its existence has been forced upon astronomers by the extreme retardation of the motion of comets, which *is naturally* ascribed to such a medium. But *then we must remember* that comets themselves are supposed on irrefragable evidence to be composed of matter of such extreme tenuity, that nothing on the surface of our globe will at all bear comparison with it, and that the medium in which they move is many times more rare, so rare indeed, that in the course of the thousands of years in which the planets have been rolling on in their vast firmament, it has exercised no *perceptible influence* whatever on their places. Hence, this is a *supplemental* theory to Newton's, not by any means antagonistic to it. Again, Leibnitz's differential calculus is founded on essentially the same doctrine of limits as Newton's fluxions, and may be regarded as the same, except that it possesses a more convenient language, and has a more extensive application. Newton called the method into existence. It is surely no disgrace to him that he did not bring it to that perfection and completeness which it hardly possesses even now.

The single case, then, in which a theory of Newton's has really fallen into general discredit is that of his corpuscular theory of light.

Now, it is not too much to say, that in Newton's time the balance of evidence preponderated greatly in favour of the corpuscular theory. The great majority of known optical facts were of the class which are equally well explained on either theory. Newton himself had been indeed the great observer in optics, and had been the first to discover so elementary a fact as the separation of the pencil of common white light into pencils of differently coloured lights. No wonder, therefore, that with so incomplete a set of observations, the theory should be incomplete. Further, the powers of analysis were not so powerful in those days as now; and many difficulties and doubts which it has set at rest were then apparently insuperable. For instance, an apparently insuperable difficulty lay at the very threshold of the undulatory theory of light which the mathematics of that age could by no means obviate. It was objected, that if light were caused by undulations similar to those which produce sound, light ought to spread out equally in all directions when admitted through a small aperture, in the same way as sound does. It was the triumph of the analysis of a subsequent period, when the principles of Newton's method of limits had received a higher development, to show by one and the selfsame investigation for light and sound, that the difference of the lengths of the waves in the two cases was quite sufficient to account for the difference in the phenomena. And so Newton may be almost said to have furnished the instrument for the subsequent overthrow of his own theory of light. So

much for the presumed decay of Newton's theories.*

Once more I would beg emphatically to put it to your readers, that the new school of engineering philosophers seems most intent upon placing the questions between themselves and mathematicians upon an entirely false issue. I insist upon this the more, as they evidently consider it their strong point. At every turn they endeavour to impress, either by direct assertion or by inuendo and implication, the false notion that the theories of mathematicians are not based on physical data at all, and that they are the first to make this attempt.

I believe I have produced abundant evidence to prove that this is directly the opposite to the true facts of the case. No physical theory ever did or ever will receive any favour from mathematicians unless it was carefully based on observed facts, and embraced the explanation of a great variety of phenomena. All that would be gained by listening to Messrs. Hopkins and Co., would be to substitute for these carefully elaborated theories, that have exercised the profoundest intellects the world has ever produced, the vague, incoherent, unintelligible — I cannot conscientiously say theories — but notions, which they offer us in lieu.

This letter has run on to a much greater length than I originally designed or could have wished. But having so many adversaries to reply to, and being anxious to remove as much as possible all misconceptions, I could not very well have been more brief without sacrificing matter which I could ill spare.

I regret that a great stress of business last week prevented my being able to get ready this answer early enough to appear in your last week's Number.

I am, Sir, yours, &c.,

W.

* The above remarks of our correspondent on Newton's Theories constitute an ample rejoinder to certain statements recently made in the *Times* in a review of Sir D. Brewster's "Life of Newton." —Ed. M. M.

SOLAR REFRACTION.

To the Editor of the Mechanics' Magazine.

Sir,—In reference to the article on "Atmospheric Refraction," by Mr. Hopkins, which appeared in No. 1677, page 294, I beg leave to make the following remarks, to which, perhaps, Mr. Hopkins may consider it necessary to give due attention.

I am prepared to admit that the case he has made out, take it all in all, looks exceedingly pretty; and but for one unfortunate circumstance, which, as I shall presently endeavour to show, somewhat mars its symmetry, I should be almost ready to become a disciple of his in this new philosophy, and submit implicitly to all the consequences, optical as well as astronomical, which it entails.

That circumstance just amounts to this —the conclusion he deduces from one series of his observations is in direct contrariety to, and completely destroys, the conclusion he draws from the other.

In the first place, he gives us a statement of the results of a series of observations made by him to discover the amount of refraction at different altitudes; and, secondly, he gives us a few more statements confirming a discovery which, it appears, he himself has made, viz., that the apparent diameter of the sun continually increases as it descends from the zenith to the horizon.

As the truth of the first proposition is incontestable, I shall not quarrel with the figures he brings forward in exemplification of it; for though his table differs most remarkably from all others which I have seen, still, whether we assume all others to be wrong and his right, or the others to be right and his wrong, in either case the proposition will be only modified, not destroyed. In general terms, then, it may be stated thus: the refraction in altitude is greatest when the sun or any other celestial object is in the horizon, and gradually decreases till it becomes zero, in the zenith. Thus, let a be the true altitude of an object above the horizon, and r the angle of refraction by which it is elevated. Again, let a' be any other true altitude, and r' its corresponding refraction in altitude; then if a is less than a', r is greater than r'.

Now, let the true place of the sun's lower limb be a, then its apparent place will be $a+r$; let d be the true angle subtended by the diameter of the sun, and let $a+d=a'$, then a' is the true place of the sun's upper limb, and its apparent place is $a'+r'$; but the difference between the apparent positions of its upper and lower limbs is just its apparent diameter, that is,

$$(a'+r')-(a+r)=(a'-a)-(r-r')=$$

apparent diameter, and $a+d=a'$, from which

$$a'-a=d$$

or true diameter; but r is greater than r', whence

$$(a'-a)-(r-r')$$

is less than $a'-a$, or the apparent diameter is less than the true diameter.

The effect, therefore, of the atmospheric refraction is to *diminish*, not to augment,

the apparent diameter of the sun or any other celestial object; and any table of observations pretending to show the contrary must be altogether inexact, for it is physically impossible that such can be the fact. I am, Sir, yours, &c.,

I. M. E.

Sale, Cheshire, Oct. 9, 1855.

DUNDAS'S MALLEABLE IRON ORDNANCE.

To the Editor of the Mechanics' Magazine.

Sir,—I noticed in your number of the 29th ult. an account of "Dundas's Malleable Iron Ordnance;" there seems to me to be no novelty in its principle. There is on the bastion of Edinburgh Castle, a monster cannon, known as Mons Meg, of a capacity to discharge stone balls upwards of 200 lbs. in weight. This celebrated cannon is said to have been forged at Mons in the fourteenth century. It is composed of iron bars, hooped together by rings of the same material, and of great thickness, driven close from the breech to the muzzle. I am at a loss to conceive in what the construction of this cannon differs from that of the Dundas ordnance; and if not, the latter is clearly not more free from liability to burst than ordinary cannon, as is evident by the fact that one of the rings of Mons Meg, near the breech, has burst, exposing the bars, and rendering it unserviceable.

I am, Sir, yours, &c.,

I. B. Lyon.

London, Oct. 3, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Bellford, Auguste Edouard Loradoux, of Essex-street, London. *Improvements in musical wind instruments.* (A communication.) Patent dated March 13, 1855. (No. 558.)

This invention mainly consists in producing uniform sounds in wind instruments furnished with pistons, both when the pistons are and when they are not worked, by means of a full column of air which is obtained, mainly, by combining new methods of piercing or perforating the moving part or solid plug of the cylindrical valve or piston, this being so pierced, as to avoid the sharp angles met with in the ordinary pistons, and in such manner that a bullet of the diameter of the column of air may pass throughout all the pistons.

Swingle, Samuel, of Aston-juxta-Birmingham, Warwick, manufacturer. *An improvement or improvements in the manufacture of certain kinds of metallic spoons, forks, and ladles.* Patent dated March 13, 1855. (No. 560.)

Claim.—Preparing the blanks from which spoons, forks, and ladles are made by the combination of cross rolling, longitudinal rolling, and prickling.

Gracie, John, of Stanley-terrace, London-road, Rotherhithe, Surrey. *Improvements in wood-planing machines.* Patent dated March 13, 1855. (No. 561.)

In the machine of Mr. Gracie the angle of the tool for removing the rough outside differs a little from that at which the smoothing tool or iron is placed, while tools placed intermediate of these two are disposed at different intermediate angles according to the kind of cut they are intended to make; but all are set at a much more acute angle than heretofore. Rollers, or pressers, separately weighted, are employed to keep the wood under operation in contact with the cutters.

Newton, Alfred Vincent, of Chancery-lane Middlesex, mechanical draughtsman. *An improved construction of engine to be actuated by the expansive force of explosive mixtures.* (A communication.) Patent dated March 13, 1855. (No. 562.)

This invention comprises an ignition apparatus, composed of a thimble and an interior tube or blow-pipe, and an arrangement and combination of a hollow piston-rod, piston, and jacket surrounding a cylinder, for the purpose of maintaining a constant circulation of water for cooling.

Goodfellow, Benjamin, of Hyde, Chester, engineer. *Improvements in regulating the power of driving the pumps of hydraulic presses.* Patent dated March 14, 1855. (No. 567.)

Claim.—Diminishing the length of the stroke, or the speed of the plungers or rams of hydraulic press-pumps, in proportion to the resistance of the articles to be compressed.

Neale, Robert, of Cincinnati, United States of America, copper-plate printer. *Improvements in copper and other plate printing.* Patent dated March 14, 1855. (No. 568.)

Claims.—1. The application of mechanical means to the inking, wiping, and polishing of engraved plates, when such plates are attached to a reciprocating bed with their engraved faces upwards. 2. The use of a certain described frame. 3. A certain described arrangement by which the inking-rollers are brought into operation and regulated. 4. A described wiping and polishing apparatus. 5. A certain described revolving brush, when applied to the cleaning belts

used for cleaning the wipers and polishers of plate-printing machines. 6. The application and use of spirits of turpentine, of a compound of caustic potass and lime, or of the two mixed with spirits of turpentine, and of whiting or other similar drying material, separately or collectively, to facilitate the cleansing of the wipers and polishers and of the plates.

KIDDER, JOHN, of Plaistow, Essex, gentleman. *Improvements in the construction of castors.* Patent dated March 14, 1855. (No. 569.)

This invention relates to a novel mode of constructing the outer case or carriage of ball and socket castors, the said case or socket being formed with a flat internal surface at the top, which rests on the revolving ball. The socket is made larger than the ball, which, in revolving, touches only on the side opposite to that in the direction of which it is travelling, and the top.

GALLOWAY, WILLIAM, and JOHN GALLOWAY, of Manchester, Lancaster, engineers. *Certain improvements in balancing or regulating the pressure on the slide-valves of steam engines.* Patent dated March 14, 1855. (No. 570.)

Claim.—"The introduction of steam into the interior of the valve, direct from the boiler, thereby pressing the valve from its face, and that internal pressure counteracted by introducing steam of less density into the valve chest, exerting its reduced force upon the exterior of the valve, but of sufficient preponderance to cause the valve to adhere to the face without that undue friction consequent upon the ordinary slide-valves."

MARLAND, JONAS, of Sun Vale Iron-works, Walsden, Lancaster. *An improvement or improvements in the manufacture of rollers for drawing, spinning, doubling, and preparing cotton, wool, flax, and other fibrous materials, a part or the whole of which improvement or improvements are applicable to shaping metals for other purposes.* Patent dated March 14, 1855. (No. 571.)

This invention consists of a mode of producing squares which form the couplings of rollers used for drawing, spinning, &c., fibrous substances. The square is first roughly forged in the usual manner. The roller (or the bar which is to form the roller) is then placed in the machine by which the square is to be completed or perfected. This machine is furnished with a slide, actuated by a cam or eccentric on a shaft which receives motion from a steam engine or other first mover. On the slide are fixed two adjustable cutting or shaping tools, which, when the machine is at work, operate simultaneously on two opposite sides of the square. The machine is also furnished with appliances by which the roller or bar on which the square is to be completed is held and moved forward during the process.

GARDNER, EDWARD VINCENT, of Norfolk-street, Middlesex Hospital, Middlesex, professor of chemistry. *Improvements in furnaces, ash-pits, flues, and fire-places, whereby smoke is prevented, fuel more perfectly consumed, and its heating value greatly economized.* Patent dated March 14, 1855. (No. 572.)

A description of the principal part of this invention formed the first article of our number for September 29, (No. 1677).

MITCHELL, EDMUND JOHNSON, of Bradford, York, stuff-merchant. *An improvement in rollers employed in the washing of wool and linen, in the squeezing of sized cotton warps, and other like purposes.* Patent dated March 14, 1855. (No. 574.)

Claim.—A mode of manufacturing the above-named rollers, and others which are required to be solid and compact, and at the same time slightly elastic, by covering the said rollers with cloth, felt, or other suitable textile material, placed so as to present the edges thereof at the outside or periphery of the roller, and submitted to heavy pressure.

TURNER, JOSEPH, of Farringdon-street, London, undertaker. *An improvement in coffin-furniture.* Patent dated March 14, 1855. (No. 575.)

Claim.—Dispensing with the eyes or loops and grips or handles, and substituting in lieu thereof ornamental plates or pieces, whether made of metal, gutta percha, or other similar material, stamped or embossed with a figure or design in relief, having the appearance of a handle or grip of the pattern or form desired inserted in loops.

GOODYEAR, CHARLES, junior, of Avenue Gabriel, Champs Elysées, Paris. *Improvements in the plates of artificial teeth.* Patent dated March 14, 1855. (No. 577.)

This invention consists in constructing the plates of artificial teeth of the hard product obtained by compounding India-rubber or gutta percha (with or without other matters) with sulphur, and subjecting the same to a high temperature.

DAVIS, ABRAHAM, of Tottenham-court-road, Middlesex, gentleman. *An improved polishing powder.* Patent dated March 14, 1855. (No. 579.)

In preparing this powder, which is to be used for polishing metals, the inventor takes the bones of animals and reduces them to charcoal in the manner ordinarily followed in manufacturing animal charcoal. He then damps the charcoal with water to give it greater consistency, grinds it to a fine powder, and presses it through a sieve or sieves to remove coarse particles from it. In order to increase the cutting or polishing

power of the charcoal he adds to it whiting and rotten-stone, or their equivalent, mixes the whole with water to a paste, dries it in an oven, grinds it to a fine powder, and sifts it through a sieve. The proportions preferred are charcoal 112 lbs., whiting 10 lbs., rottenstone 5 lbs.

HETHERINGTON, JOHN, of Manchester, Lancaster, machine-maker, and ARCHIBALD VICKERS, of Bristol, Gloster, cotton-spinner. *Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.* Patent dated March 14, 1855. (No. 580.)

Claims.—1. The adaptation to the drawing frame of a scale or balance lever for arresting the motion of the machine upon a breakage taking place, or upon a roller becoming lapped. Also, the adaptation of a lever or other apparatus beneath the drawing rollers, such lever or apparatus being operated upon by the lapping of the material, so as to bring the stop motion into action, and the employment for that purpose of certain hooks by which the weights are suspended. 2. Placing the spindles of throstles so that those on one side are not opposite to those on the other. 3. The application to doubling frames of rollers or other apparatus for holding up the broken end or ends. 4. Applying to doubling, slubbing or roving, frames, &c., apparatus for severing the remaining thread or threads upon one or more becoming broken by the operation of the machine; also, the use of apparatus for arresting the action of the top roller when a thread breaks, either by raising the said roller or causing it to be locked.

LISTER, WILLIAM, of Dunsa Bank, near Richmond, York, farmer. *An improved implement for raising or loosening turnips and other roots in the ground, and cutting off the tails thereof.* Patent dated March 14, 1855. (No. 581.)

The inventor mounts in a suitable frame (which runs on wheels and is drawn by animal power) adjustable blades which will enter the ground and make a horizontal cut somewhat below the bulb of the turnips, thereby removing the tails of the turnips and loosening their hold in the ground.

BACH, HENRY, of Sheffield, York, hosier. *Improvements in sash-frames.* Patent dated March 15, 1855. (No. 582.)

This invention consists in the use of hollow glass pillars or facings, gilded or otherwise ornamented on the back or inner surface, so as to represent brass pillars, &c.

ROBINSON, NATHAN, overlooker, JOHN LISTER, mechanic, and HENRY STEVENSON, pattern-maker, all of Bradford, York. *Improvements in looms for weaving cocoa-nut matting, and similar fabrics.* Patent dated March 15, 1855. (No. 583.)

Claims.—1. The use of a shuttle for holding the cop without bobbin or pike. 2. The use of apparatus to draw or drag the shoot of weft tight across the fabric. 3. The use of a tappet or tappets, capable of being varied, for raising and lowering the picking shaft, so as to pick at any or every stroke of the lathe.

BUTT, ROBERT MOORE, of Fairfield Works, Bow, Middlesex. *Improvements in the manufacture of night-lights.* Patent dated March 15, 1855. (No. 584.)

In constructing the paper cases for night-lights, in place of simply introducing the bottoms of the short cylinders of paper, the inventor either causes the bottom and the cylinder to be formed of one piece of paper, or he covers the joint and forms it fluid tight, saturating the case with a solution of salt suitable for rendering the paper uninflammable.

GRIGNON, GEORGE, of Sutherland-square, Walworth, Surrey, gentleman. *Certain improvements in the means of launching or detaching boats from ships' sides or davits, and in the apparatus and tackle to be used for that purpose, that the operation may be speedy, spontaneous, and safe.* Patent dated March 15, 1855. (No. 588.)

The inventor proposes that for the purpose of working the tackle and the running ropes there shall be placed at the foot of each davit, at its junction with the bulwark, an additional block, pulley, swivel, or other similar contrivance, so that the ends of the ropes holding the boat may be carried through, and meet at the centre in a block, pulley, or other contrivance placed in the bulwark of the vessel, &c.

MITCHELL, JOSEPH, engineer, of Lansdown-road, Sheffield, York. *Supplying grease, tallow, or oil, either with or without the addition of black-lead, to locomotive engines, horizontal and beam engines, marine engines, and Nasmyth's patent steam-hammer.* Patent dated March 16, 1855. (No. 590.)

The inventor describes a brass grease cup or lubricator containing three valves instead of the taps ordinarily used, which valves are opened and closed by a spiral spring and an expanding catch box containing three inclines.

HILL, WILLIAM, of Birmingham, Warwick, tool-maker. *Improvements in metallic pens and pen-holders, and in ornamenting metallic pens and penholders.* Patent dated March 16, 1855. (No. 591.)

This invention mainly consists in making folds or coils between the bodies and points of metallic pens, for the purpose of increasing their elasticity, and, where required, in so forming the folds or coils as to produce "an oblique yielding" in the point of the pen.

[redacted]

SMITH, MARK, of the firm of William Smith and Brothers, of Heywood, Lancaster, power-loom makers. *Improvements in looms for weaving.* Patent dated March 16, 1855. (No. 592.)

Claims.—1. Certain improvements in the picking motion of looms whereby motion in the direction of their axis is given to the picking shafts. 2. An improved combination of machinery for working the heddles. 3. Supporting the warp beam in levers for the purpose of diminishing the resistance to the unwinding of the warp in proportion to the reduction in the weight of the warp beam. 4. The use and application of an escapement elbow lever when applied to the taking-up motion of looms. 5. An improved combination of parts for stopping looms in the absence of the weft. 6. An improved arrangement of parts applicable to looms in which two shuttles are used for keeping the weft of one shuttle out of the way of the weft fork, when the lay beats up, after the other shuttle has been thrown across the shed.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the application of carbonic acid gas as a motive power.* (A communication.) Patent dated March 17, 1855. (No. 600.)

The main feature of this invention is the generation of the gas or vapour by the aid of a water bath, whereby a uniform heat is sustained, and the vapour kept at a uniform or nearly uniform pressure.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in steam engines.* Application dated March 17, 1855. (No. 601.)

This invention mainly consists in the application and use of steam engines having two open cylinders placed in the same axial line, and having the steam chest and its valve or valves situated between the two inner ends of the cylinders, so as to dispense with stuffing boxes.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WILLETT, THOMAS WILLIAM, of Belsize-road, St. John's-wood, Middlesex, civil engineer. *Certain improvements in swimming belts.* Application dated March 13, 1855. (No. 559.)

This invention is applicable only to that class of portable swimming belts in which the water-proof tube forming the belt is attached to the person of the swimmer, and kept wholly or in part distended by suitable mechanical means, such as a spiral wire, or a series of rings, and in which the air is drawn into the interior of the tube by extending it in the direction of its length, and the invention consists in certain methods of admitting and retaining the air in such tubes.

ILIFFE, CHARLES, of Birmingham, Warwick, manufacturer. *Improvements in the manufacture of metallic rods, bars, and tubes.* Application dated March 13, 1855. (No. 563.)

In making iron tubes the inventor casts a cylinder or billet, either in pig iron alone, or in a mixture of pig iron and wrought iron scrap, which can be afterwards rolled out to any desired length upon a mandril, and for bars and rods he first makes a cylinder or billet in wrought iron, then fills this with cast iron, and rolls the whole out together.

COOKE, RICHARD CAMPBELL GREEN, of New Swindon, Wiltshire, gentleman. *Improvements in military and other cloaks.* Application dated March 14, 1855. (No. 564.)

The inventor proposes to make cloaks in such manner that they can readily be transformed into low tents, each sufficiently capacious to overhang the body of a person reclining on the ground.

RILEY, GEORGE, of Portland-place-north, Clapham-road, Surrey. *An improved process for the manufacture of starch or grape sugar.* Application dated March 14, 1855. (No. 565.)

This invention consists in the manufacture of starch or grape sugar from the meal of any of the cereals, by boiling the same in water acidulated with sulphuric acid, under a pressure greater than that of the atmosphere.

GRAY, HENRY, of Clement's-lane, Strand, Westminster, printing-ink manufacturer. *Manufacturing from vegetable substances a material which can be applied to all adhesive surfaces for either useful or ornamental purposes as a substitute for, and in the same manner as flock is now used or applied on adhesive surfaces.* Application dated March 14, 1855. (No. 566.)

The material mentioned in the title is made from wood, dust, or any other vegetable fibrous substance, by drying, grinding, and pulverising the same to various degrees of fineness, so as to represent flock made from wool.

SOELMAN, WILLIAM, of Bennett-street, Fitzroy-square, gentleman. *Improvements in propellers.* Application dated March 14, 1855. (No. 573.)

"The object of these improvements is to diminish the loss of power occasioned by centrifugal force and lateral radiation of water." For these purposes the inventor proposes certain methods of varying the angles of the planes or blades.

BERNARD, JULIAN, of Club Chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture of boots and*

shoes or other coverings for the feet and in the machinery connected therewith. Application dated March 14, 1855. (No. 576.)

This invention relates to the cutting or shaping of the heel portions of boots and shoes by the aid of partially self-acting machinery. The apparatus is self-acting in its essential details, and is entirely contained or held upon an independent table or stand, of a height suitable for the operator.

WRIGHT, RICHARD, of Richmond, York, boot-maker. *An improvement in the construction of swords.* Application dated March 14, 1855. (No. 578.)

This invention has for its object so to construct a sword that it may have revolving pistol barrels applied near the handle.

HUMPHRYS, EDWARD, of Deptford, Kent, engineer. *Improvements in applying heat to steam boilers.* Application dated March 15, 1855. (No. 585.)

These improvements consist in constructing steam boilers with a chamber to receive the heat and products derived from a cupola or blast furnace, in connection with the heat chamber of the boiler. The heat and products of combustion are distributed through the boiler by tubes communicating with the heat chamber.

LORET-VERMEERSCH, FRANÇOIS, of Malines, Belgium, civil engineer. *Stopping trains on railroads.* Application dated March 15, 1855. (No. 586.)

This invention consists in the employment of a break or breaks worked by a piston in a steam cylinder, for the purpose of stopping or checking the speed of locomotive engines, and in causing breaks to act upon the wheels of railway carriages by the action of the buffers. The buffer-rods being thrust inwards beyond a given point, act upon certain levers, cranks, and rods, and force the break-blocks against the wheels.

MONDAY, WILLIAM, the younger, of the firm of Sollett, Monday, and Co., of Kingston-upon-Hull, York. *Improvements in preparing, mixing, and grinding the various kinds of plumbago, graphite, or blacklead, either together or separate, and with or without other materials, for polishing, lubricating, and for other purposes, and in otherwise preparing the same for sale.* Application dated March 15, 1855. (No. 587.)

This invention consists—1. In steeping or washing the above-named substances in acid or acid and water, then grinding and applying steam to them, then putting them into vats, so as to intercept grit, &c., and then levigating them. 2. In reducing such substances to a state of pulp or paste, by mixing them with soap or soap and water, or such other materials as may be capable of maintaining them in a state of paste, pulp, or liquid, for wholesale and retail distribution, in which state they are packed in boxes, pots, &c.

WICKENS, HENRY, of Tokenhouse-yard, London, gentleman. *Improvements in the means of communicating signals in railway trains.* Application dated March 15, 1855. (No. 589.)

The inventor proposes to communicate signals on railway trains by means of a series of rods laid along the carriages, and formed with forks at their ends so as to take into each other in such manner that when one is caused to rotate the whole are also compelled to rotate with it.

WREN, JOHN WALTER CAWLEY, of Tottenham-court-road, Middlesex, iron bedstead-manufacturer. *An improved construction of invalid bed.* Application dated March 16, 1855. (No. 593.)

The inventor attaches to the ordinary bedstead-frame a rectangular frame of a corresponding size, which carries a loose sacking, and is provided with a suitable opening to admit of the application of a bed-pan. This frame is attached to the bedstead by two or more pairs of parallel levers jointed to the sides of the frames.

PICTON, THOMAS, of Liverpool, Lancaster, wheelwright. *Improved apparatus for erecting and supporting scaffoldings or stages, and which is also applicable as a fire-escape.* Application dated March 16, 1855. (No. 594.)

This invention consists in the adaptation of a system of levers resembling the lazy-tongs arrangement to the elevation and depression of moveable platforms.

WINSTANLEY, WILLIAM, and JOSEPH KELLY, of Liverpool, Lancaster, engineers. *Improvements in the construction of force-pumps and their appurtenance.* Application dated March 16, 1855. (No. 595.)

This invention consists mainly in placing two upright single-action pumps within an outer casing which forms the air vessel or vessels; and in constructing the nozzle of the ejection or hose pipe to be used therewith of a double tube, having a cavity or air space between the inner side of the larger outer pipe and the outer side of the smaller inner tube.

MAUDUIT, ARMAND, and FREDERIC HYPPOLYTE OUIN, of Paris. *An hydraulic machine.* Application dated March 16, 1855. (No. 596.)

This machine consists of a cylinder which works up and down through a shifting box, and in which cylinder is a fixed piston. As the cylinder descends away from the piston the fluid enters the space between the piston and a partition in the cylinder through a

valve in the piston, and when the cylinder ascends a valve is opened in the partition and the water passes from the before mentioned space to the under side of the partition, whence it is forced up a delivery pipe by the succeeding down stroke of the cylinder.

BURNETT, SIR WILLIAM, knight, of Somerset-house, and JOHN WEIR DRAPER BROWN, R.N., of Haslar Hospital, Gosport. *Improvements in constructing signal lanterns.* Application dated March 16, 1855. (No. 597.)

"When it is wished to have a lantern consisting of four plain convex lenses," say the inventors, "a hollow glass sphere is employed with a portion of the upper and lower parts removed, so as to admit of the introduction of a rectangular tube of glass which will divide the remainder of the sphere into four hollow compartments each being convex outwards and plain inwards. Into these compartments coloured fluids are introduced, and a suitable burner is fitted within the rectangular glass tube."

PETITJEAN, TONY, and LOUIS PETRE, of Upper John-street, Tottenham-court-road, London, civil-engineer. *Certain improvements in the manufacture of Daguerreotype plates and of electro-plated sheets of metal, part of which improvements may be applied to the production of polished surfaces on metallic articles.* (A communication.) Application dated March 17, 1855. (No. 598.)

In preparing plates according to this invention, a piece of glass or other suitable material is first coated with a metallic salt, or otherwise prepared to receive deposits, and is then dipped in a trough communicating with a galvanic battery containing a silver bath, and silver is precipitated on the coated side of the piece. When a sufficient layer of silver is deposited, the piece is taken out and placed in another trough containing a copper bath, allowing it to be immersed sufficiently long to have deposited upon it a coat of copper of sufficient thickness.

BREITTMAYER, EUGENE, of Paris, France. *A new or improved mortising machine.* Application dated March 17, 1855. (No. 599.)

This machine is mounted on a lathe-bed, and consists of a left hand headstock which can be raised, lowered, and fixed at any suitable height, by means of a screw in the lathe-bed, and carries a spindle or arbor on which is fastened a screw or other chuck for securing a drill, bit, or auger, receiving motion by means of a pulley or the spindle.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in steam pressure and other indicators.* (A communication.) Patent dated March 17, 1855. (No. 602.)

These improvements consist in the application to indicators of a bell or gong which is sounded when an alarum is to be given, by the action of a current of electricity upon the hammer, after the mode at present adopted in electric telegraph apparatus, the circuit for such current being established or broken by the working parts of the safety apparatus.

PROVISIONAL PROTECTIONS.

Dated August 25, 1855.

1928. Charles Frederick Stansbury, of Gracechurch-street, London. An improved shirt wristband. A communication from Rufus K. Chandler, of Richmond, Virginia, United States.

Dated September 10, 1855.

2047. Edmund Sharpe, of Swadlincote, Derby, earthenware manufacturer. Improvements in pans for water-closets.

2049. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in paddle-wheels. A communication.

2051. Thomas Craven, of Nelson-street, Goodman's-fields, Middlesex. Improvements in furnace bars.

Dated September 11, 1855.

2053. Henry Bull, of Knowle Green-house, Staines, Middlesex, gentleman. Railway permanent way materials.

2057. Matthew Curtis, of Manchester, Lancaster, machinist, and John Wain, of the same place, mechanic. Improvements in machinery for preparing and spinning cotton and other fibrous substances.

2058. Joseph Camp Griffith Kennedy, of St. James'-street, Piccadilly, Middlesex, gentleman. Improvements in the mode of and apparatus for transmitting signals by the use of the electric current, part of which improvements is applicable to the regulating of machinery generally. A communication.

2059. Etienne Charles Zacharie Bouchard, civil engineer, of Paris, French Empire. Certain improvements in producing gas for lighting and heating.

Dated September 12, 1855.

2061. John Macintosh, of Great Ormond-street, Middlesex. Improvements in springs.

2063. Francis Gybbon Spilsbury, of Chaudfontaine, Belgium, gentleman, and Frederick William Emerson, of Stable Hobba, near Penzance, Cornwall, manufacturing chemist. Improvements in the manufacture of paints and pigments.

Dated September 13, 1855.

2065. Benjamin Barber, of Tring, wood turner, John Butterfield, of Great Berkhampstead, saddler, and Thomas Austin, of the same parish, all in Hertfordshire, plumber. Improvements in mangles.

2067. Pierre Bernardet de Lucenay, of Paris, France, retired officer. Certain improvements in the batteries of guns and pistols.

2069. John Blissett, of High Holborn, Middlesex, gun-maker. Improvements in the construction of revolving chamber fire-arms.

2070. Joseph Henry Tuck, of Pall-mall, Middlesex, civil engineer. Improvements in apparatus for carrying on submarine operations. A communication.

2071. Abram Longbottom, of Moorgate-street,

London, and Soho Foundry, Leeds, engineer. Improvements in the manufacture of gas when oils or fatty matters are used.

Dated September 14, 1855.

2073. Jean Pierre Garbai, of Paris, French empire, gentleman. An improved powder or composition for cleaning and preserving the teeth.

2075. Théodore Gomme, jun., and Charles Eugène Auguste Beaugrand, of Paris, France. Certain improvements in machinery for manufacturing copper and other metal wares.

2077. George Dewdney, of Fenchurch-street, London, jeweller. An improved manufacture of protector applicable to the chest, throat, and other parts of the body requiring protection from the cold.

2079. William Frederick Thomas, of St. Martin's-le-Grand, London. Improvements in sewing machines.

Dated September 20, 1855.

2118. Henry Deacon, of the Woodend Chemical Works, Widnes Dock, near Warrington, Lancaster, manufacturing chemist. Improvements in the manufacture of solutions of carbonate of ammonia and in the manufacture of caustic ammonia.

2120. John Palmer, of Stockton-on-Tees, Durham, agricultural implement dealer and manufacturer. Improvements in the construction of reaping machines.

Dated September 21, 1855.

2122. John Dale, of Manchester, Lancaster, manufacturing chemist. Certain improvements in appropriating waste products arising in the manufacture of certain chemical compounds.

2124. Ursurer Joseph Brasseur, of Rue de Hambourg, Paris. Improvements in machinery for winding weft. A communication from Theodor Clovis Lefevre and Joseph Victor Muloteaux, of Paris.

Dated September 22, 1855.

2126. James Eaton, of Charing-cross, Strand, Middlesex. Improvements in shuttles and in making cop tubes used in shuttles.

Dated September 24, 1855.

2128. Hector Mottet, jun., of Verviers, Belgium. Scouring woollen goods during the action of fulling or otherwise.

2130. John Moreton Marchinton, of Bruce Works, Sheffield, York, machinist, &c. Improvements in the construction of vices.

2132. Charles Manby, of Great George-street, Westminster, and William Piper, of Palace-road, Stangate. Improvements in machinery for cutting stone. A communication from Eugéne Chevallier.

2136. George Simmonds, of Bennett-street, Stamford-street, Blackfriars-road, Surrey, plate leveller. Improvements in the construction of bedsteads.

Dated September 25, 1855.

2138. William Wright and John Wright, of Stamford, Lincoln, machinist. Improvements in machinery for crushing grain.

2140. Charles Frederick Whitworth, of Halifax, York, gentleman. Improvements in signals used on railways, and in parts of apparatus in connection therewith.

2142. Frederic Rainford Ensor, of the Park, Nottingham. Improvements in bobbin net or twist lace machines.

Dated September 26, 1855.

2144. Gustavus Huguenin, of Greek-street, Middlesex, watch manufacturer. Certain improvements in watches and other timekeepers.

2146. John Norbury, of Salford, Lancaster, engineer. Certain improvements in machinery or apparatus applicable to hydraulic presses.

2148. James Nasmyth, civil engineer, of St. Germaine-en-Laye, France. Improvements in the modes of obtaining motive power by a rotary or circular movement, and of applying it.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2150. Thomas Deakin, of Hazelwell-mills, near King's Norton, Worcester, engineer. New or improved machinery for manufacturing bayonets, matchets, and swords. September 26, 1855.

2164. Thomas Clegg, of Massachusetts, United States. Certain new and useful improvements in the construction and manufacture of loom harness. September 28, 1855.

2165. Thomas Barrows, of Massachusetts, United States. A new and useful improvement in the treatment of wool preparatory to its being carded, spun, or woven. September 28, 1855.

2174. William Neufville Martin, of Newman-street, Oxford-street, Middlesex, captain in the army. Improvements in the construction of folding and portable crates, boxes, baskets, packing-cases and huts. September 29, 1855.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENTS.

A petition will be presented to the Privy Council by Alfred Jeffery, late of Lloyd-street, Pentonville, but now of Huntingdon-street, Islington, carrying on business at Bunton's Works, Limehouse, praying for a prolongation of the letters patent granted to him, for England, April 15, 1842, and for Scotland, October 18, 1842, for "A new method of preparing masts, spars, and other wood for shipbuilding and other purposes."

On the 17th November next, or on the next day of sitting of the Judicial Committee of the Privy Council, if it do not sit on the day mentioned, an application will be made to the committee to fix an early day for hearing the matters contained in the said petition, and any person desirous of being heard in opposition must enter a caveat to that effect in the Privy Council-office on or before that day.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 9th,* 1855.)

1184. Léon de Parienté. Improvements in cutting or sawing wood. A communication.

1226. Edward John Payne. Improvements in the manufacture of covered thread. A communication from Christophe Emile Dumenteil, of Paris.

1230. George Rogers. Improvements in apparatus for retaining and drawing off aërated liquors. A communication.

1238. Emanuel Wharton. Improvements in the machinery for manufacturing metal tubes.

1239. Emanuel Wharton. Improvements in steam engines.

1242. William Rimington, jun. A new spring hinge for swing doors.

1246. Samuel Bickerton. An improved oil lubricator.

1251. Adrien Jackson, Eli Kershaw, and Joseph Roberts. Improvements in looms for weaving.

1252. Peter Armand Lecomte de Fontainemoreau. Certain improvements in the treatment of vegetable and animal oils. A communication.

[redacted]

1257. Henry Spencer. Improvements in machinery or apparatus for twisting and winding spun yarns or threads.
1258. John Boyd. Improvements in letter-press printing-machines.
1259. John Lane and John Taylor. An improved engine.
1264. François Celestin Armelin, jun. Certain improvements in ploughs.
1270. Horace John Kaye and Percy Burrell. An improved mode of communicating to each of two trains that are in motion the distance they respectively are from each other.
1296. John Boucher. Improvements in powder-flasks and in the sights and ramrods of fire-arms.
1299. John Ramsbottom. Improvements in safety-valves and feeding-apparatus for steam boilers.
1313. George Frederick Chantrell. Improvements in apparatus applicable to the manufacture and revivification of animal or vegetable charcoal.
1319. Thomas Bright. Improvements in apparatus for the prevention of waste in water or other fluid supplies.
1336. John Joseph Liebisch. Improvements in rails for railways.
1349. Edward Rush Turner and Frederick Turner. Improvements in machinery or apparatus for crushing and grinding grain, seeds and pulse.
1402. John Henry Johnson. Improvements in the storing and treatment of grain. A communication from Jean Gustave De Coninck, of Havre, France, merchant.
1416. William Edward Newton. Improved machinery for polishing or finishing thread. A communication.
1417. Jean François Victor Fabien. Improved machinery for manufacturing wheels. A communication.
1425. Richard Keevil. Improvements in vessels used in the manufacture of cheese.
1438. John Gay Newton Alleyne and Henry Strafford. Improvements in railway brakes.
1440. Stanislas Tranquille Modeste Sorel. A machine for applying adhesive matters on stuffs, and also for applying on the said matters other substances or stuffs.
1486. Joseph Eccles. Improvements in the manufacture of bricks, tiles, and other articles made of plastic materials, and in machinery and arrangements or apparatus to be used for the purpose.
1490. William Woodcock. Improvements in machinery for making bricks and other articles of plastic materials.
1516. Julien Arnold Bellay. Improvements in manufacturing articles of earthenware and china.
1608. Walter Christopher Thurgar. The preservation of the fluid substance of fresh eggs.
1637. Mathieu François Isoard. Improvements in apparatus for generating steam and for applying the same to motive power purposes.
1864. William Fawcett and Francis Best Fawcett. Improvements in the manufacture of carpets and similar fabrics, and in apparatus used therein.
1877. Alfred Savage. Improvements in the means or mechanism for treating tea, sugar, coffee, chicory, and such substances as require the processes of separation, reduction of size, and mixing, or any one or two thereof.
1909. Joseph Gilbert Martien. Improvements in preparing certain oxides of iron for use, and for apparatus to be used therein.
1992. William Armand Gilbee. Improvements in the production of carburetted hydrogen gas. A communication from M. Salmon, of Paris.
2003. William Armand Gilbee. Improvements in the manufacture of glass. A communication from M. Salmon, of Paris.
2013. Joseph Gilbert Martien. Improvements in roasting, calcining, and oxidizing and sublimning metallic and mineral substances, and in the apparatus and means to effect the same.
2033. Joseph Henry Tuck. Improvements in dredging and excavating-machinery. A communication.
2057. Matthew Curtis and John Wain. Improvements in machinery for preparing and spinning cotton and other fibrous substances.
2058. Joseph Camp Griffith Kennedy. Improvements in the mode of and apparatus for transmitting signals by the use of the electric current, part of which improvements is applicable to the regulating of machinery generally. A communication.
2060. James Higgin. Improvements in treating madder or preparations of madder, so as to obtain a colouring substance therefrom.
2061. John Macintosh. Improvements in springs.
2065. Benjamin Barber, John Butterfield, and Thomas Austin. Improvements in mangles.
2070. Joseph Henry Tuck. Improvements in apparatus for carrying on submarine operations. A communication.
2076. Vincent Scully and Bennett Johns Heywood. Improvements in bottles, inkstands, and other vessels, and in caps or stoppers for closing the same.
2077. George Dewdney. An improved manufacture of protector applicable to the chest, throat, and other parts of the body requiring protection from the cold.
2082. Joseph Gilbert Martien. Improvements in the manufacture of iron and steel.
2084. Vincent Scully and Bennett Johns Heywood. An improvement in the manufacture of certain articles which are subject to the corroding action of the air and moisture.
2098. James Tennant Caird. Improvements in steam engines.
2132. Charles Manby and William Piper. Improvements in machinery for cutting stone. A communication from Eugéne Chevallier.
2164. Thomas Clegg. Certain new and useful improvements in the construction and manufacture of loom harness.
2165. Thomas Barrows. A new and useful improvement in the treatment of wool preparatory to its being carded, spun, or woven.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

146. Edwin Lewis Brundage.
277. Admiral the Earl of Dundonald.
399. Joseph Hopkinson.
400. Simon Pincoffs and Henry Edward Schunck.
415. William Beckett Johnson.
441. John Kealy.
588. George Fergusson Wilson and Edward Partridge.
600. George Fergusson Wilson.
619. George Fergusson Wilson.
620. George Fergusson Wilson.
667. William Frederick de la Rue and George Waterston.
756. Francis Montgomery Jennings.

LIST OF SEALED PATENTS.

Sealed October 2, 1855.

742. Hiram Powers.
743. William Henry Tooth.
744. William Eathorne Gill and Henry Brinsley Sheridan.
745. Louis Cornides.
753. John Crowley.

Sealed October 5, 1855.

756. Thomas Squire.
757. William Goostrey, George Hulme, and Charles Hough.
758. Isidore Carlhian and Francois Isidore Corbière.
768. Robert William Waithman.
771. Henry Gerner.
772. Richard Stones.
773. Joseph Hull.
774. Joseph Aresti.
780. Edward O'Callaghan.
784. William Ricketts and Thomas Bulley.
787. Alexander Chaplin.
788. John Henry Johnson.
796. John Alderman.
807. Soren Hjorth.
821. Richard Archibald Brooman.
858. John Lawson and Somerville Dear.
872. François Jacot.

NOTICES TO CORRESPONDENTS.

David Tusks.—It is impossible for us to say whether a daylight reflector would, or would not, produce the effect you require, as we do not know with what measure of light the apartment is at present supplied. We find the reflectors very useful. You should write to the manufacturers for a scale of prices.

Engineer.—Your letter has come to hand. We have not room for it at present. As the subject is incompletely treated in it, we shall be glad to receive your additional remarks before we publish it.

H. Laverock Philip.—Yours is received with thanks. We may publish an engraving of your design ere long.

We are compelled to reject several communications on the "Projectile Controversy," which would add but little interest to it.

CONTENTS OF THIS NUMBER.

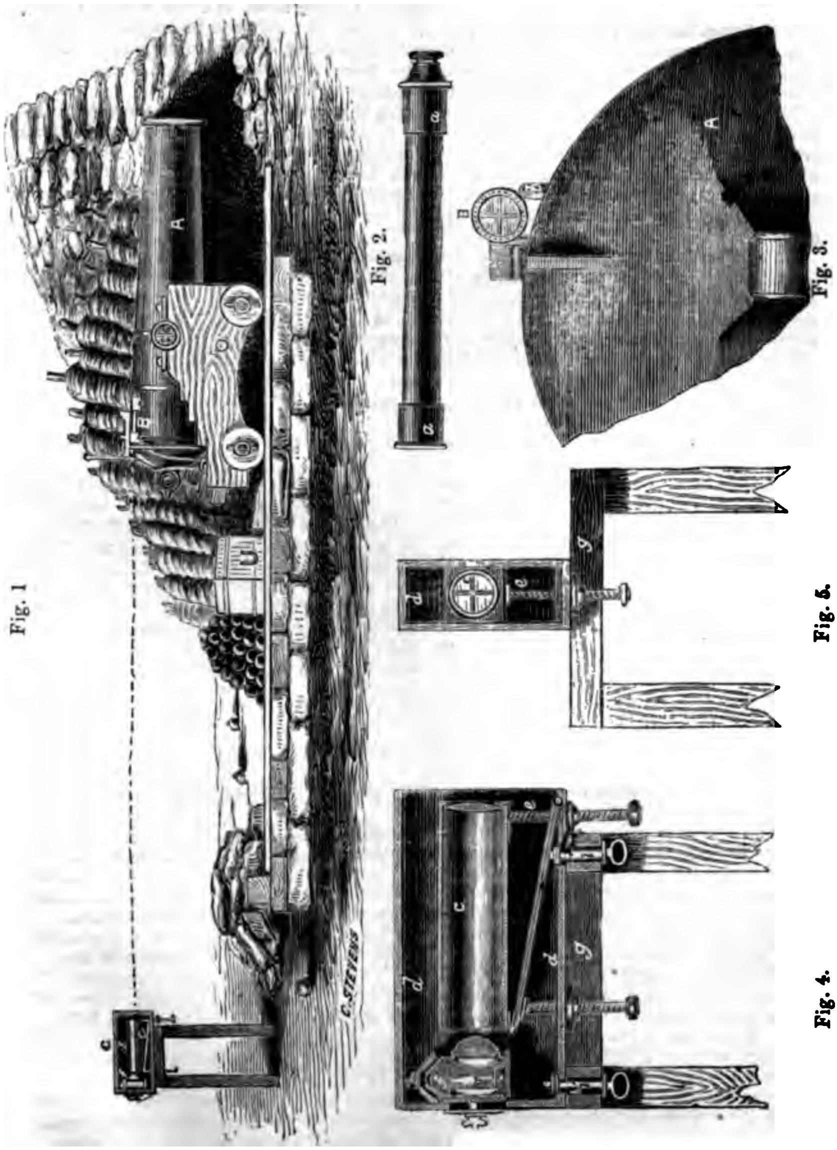
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1680.] **SATURDAY, OCTOBER 20, 1855.** **[PRICE 3D.**

Edited by R. A. Brooman, 166, Fleet-street.

MAJOR DAVIDSON'S APPARATUS FOR POINTING ORDNANCE.



MAJOR DAVIDSON'S APPARATUS FOR POINTING ORDNANCE.

(Patent dated January 17, 1855.)

CONSIDERABLE inconvenience and difficulty arise in pointing ordnance with any accuracy or certainty, except when the object aimed at or to be struck is distinctly visible from the gun or other piece of ordnance; and as from the recoil of the piece after every discharge the position of it is changed, and consequently requires replacing in its original position before being fired again, it is of the greatest importance, in order to ensure accuracy in firing, that the piece should be restored as near as possible to its original position. It is scarcely necessary to point out the difficulty of so doing, or of obtaining even an approximately correct aim at night, or when the piece is surrounded with dense smoke, which often effectually obscures the object to be hit.

Major Davidson, of the Honourable East India Company's Service, has accordingly invented an arrangement, the aim of which is to facilitate the bringing of the piece to its original position, or as nearly so as may be necessary for all practical purposes, so that when once the range and correct aim of the gun has been ascertained with certainty, the gun may always be properly pointed after every discharge, no matter how the position of the piece may have been disturbed or altered by the recoil occasioned by the previous discharge.

This object is effected by means of a simple apparatus, to be used in conjunction with a telescope applied to the piece by means of supports, whereby the axis of the telescope may always be made to maintain a constant relative position to the axis of the piece. For convenience he proposes not to attach the telescope to the piece, but merely to adapt thereto supports, or studs, on or against which the telescope may be laid or made to rest while an observation is being taken. Detached from the piece, and placed in any convenient position in relation to it, he places an instrument or apparatus, which he denominates the collimator, as it is constructed on the same principle as collimators used for astronomical purposes. This collimator must be so placed that the observer (when the telescope is placed in its supports on the gun) may, by a simple adjustment of the apparatus, look through the telescope, and down the tube of the collimator.

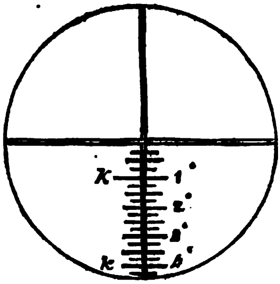
Fig. 1 is a side view of a gun in position in a battery, with these improvements adapted thereto. A is the gun or piece of ordnance; B, the telescope adapted thereto; and C, the collimator placed on a stand behind the gun. Fig. 2 is a side view of the telescope to be employed for the purposes of the invention. It is furnished at each end with a collar, *a*, of gun metal, and has in its focus a cross, either drawn on glass or made of wires, as is usual in levelling telescopes. On the piece of ordnance are fixed four brass knobs or screws, *b b*, having round heads. Fig. 3 is an end view of the gun, showing the knobs with the telescope in position thereon, as when an observation is being made. These knobs are screwed into the gun, a little on one side of the ordinary sight, and in front of the touch-hole. It will be seen in figs. 1 and 3, that the knobs, *b b*, form supports for the telescope to rest on, and they may be fixed either parallel to the axis of the gun, or at an angle, so as best to suit the most firm and convenient position in which to place the collimator, either behind or in front of the gun within the battery. In place of employing a collimator, such as that hereafter described, the cross in the telescope might be brought to bear on two crosses or points, placed one behind the other at any convenient spot, which, when brought into allignment with the cross in the telescope, will show that the piece of ordnance has been brought into its normal position.

Major Davidson prefers, however, to use the collimator, as the other arrangement would require the gun to be brought back into the identical position it originally occupied, which is difficult, if not impossible, in practice; whereas, when the collimator is used, it will only be necessary to catch sight from the telescope of one of the parallel rays proceeding from the collimator tube, and when this is done, it will demonstrate that the piece has been brought in a line parallel to and within an inch or so of its original position. Fig. 4 is a longitudinal section of the collimator, and fig. 5 is a cross section of it. It consists of a square or other shaped wooden or metal tube, *c*, having a lens fixed therein, and is mounted in an external case in order to admit of adjustment, as will be hereafter explained. The collimator tube, *c*, is provided internally with a cross similar to that in the telescope, B, on the gun. This cross is placed in the focus of the lens of the collimator, and is illuminated by a lantern or lamp, *f*, at the other end. The collimator tube, as before mentioned, is fixed within a box, *d d*, as shown in figs. 4 and 5, and by means of two elevating screws, *e e*, it is capable of motion in the vertical plane, either parallel or in angular elevation. This collimator, if the telescope is laid obliquely on the gun, may be placed on the ground; but it is thought better, for reasons hereafter mentioned, to place the telescope parallel, or nearly so, *to the axis of the gun*, in which case the collimator is raised upon a stand, which may be

[redacted]

formed by four posts driven into the ground clear of the recoil of the gun, as shown in figs. 1, 4, and 5. On the top of the posts is fixed a square frame of wood, *g*, having two slot holes, *h*, in two of its opposite sides, as shown in fig. 4; through these slot holes pass two

Fig. 6.



screws, *i i*, which enter the bottom of the collimator-box, and admit of the box being clamped to the frame, and thereby secured in any position. As these slot holes are wider than the screws, the collimator can be moved not only to either side on the horizontal plane, but also angularly in that plane. Thus the collimator has motion in every required direction.

The apparatus is used in the following manner:—The gun is first laid by its usual sights on the object to be struck, and the correctness of the aim having been ascertained by firing a few experimental shots, the telescope is held against the knobs, *b*, by the hand while the gunner looks through it at the collimator, which is then moved until the cross in its focus intersects with that in the telescope. The telescope is then removed, and the collimator having been clamped in the position so found, remains a fixture while the firing continues. The gun may then be fired, reloaded, and run up into the embrasure, and is afterwards pointed or laid on the object, not by looking along the ordinary sights, but by applying the telescope to the knobs on the gun as before, and by moving the gun with the usual appliances until the cross of the telescope, B, intersects that of the collimator, C; and when this is done, the gun must have been brought into the position in which it stood before the first shot was fired, or else in one exactly parallel to it in every respect; and it is hardly necessary to say that if the axis of the gun be placed parallel to and within an inch or two of its original position, the effect as regards accuracy of aim is, for all practical purposes, the same as if it were in the identical position in which it was first laid, for the amount of error in the striking of the shot due to this cause will be merely the distance by which the gun has been moved out of its first position, and can never exceed an inch or two.

The object glass of the collimator being from four to five inches in diameter, a column of parallel rays of this diameter will issue from it, and be met by a similar column, though of less diameter, issuing from the telescope; and as each of these rays gives the image of the cross in the instrument from which it issues, the requisite intersection can be made by the coincidence of any of the rays of the telescope and collimator, so that it is unnecessary to bring the axis of the two instruments into exact coincidence. This allows of considerable latitude as to the position of the gun, and renders unnecessary any more delicate adjustment than is now requisite in laying guns by the ordinary sights; and this constitutes one of the chief advantages arising from the use of the collimator.

Moreover, the two crosses being greatly magnified and in the same plane of vision, their intersection can be effected more readily and with much more accuracy than the allignment of the ordinary sights of the gun with the object aimed at, the three points to be brought into coincidence being in the latter case at different distances from the eye, so that only one of the three can be seen at the same moment with distinctness. A further advantage to be derived from the use of the telescope is, that it remedies defective sight in the gunner, and enables a short-sighted man to lay a gun with as much accuracy as another whose vision is perfect.

As already stated, the telescope may be laid obliquely on the gun and the collimator placed upon the ground; but this would be suitable only for short ranges, as at short ranges it is not usual to make any correction on account of the gun losing its horizontal position, from the platform giving way under a heavy fire; but to render this apparatus available for long ranges it is necessary so to adjust the knobs that the axis of the telescope would be parallel or nearly so to the axis of the piece; the collimator must, therefore, for this purpose necessarily be raised on a stand immediately behind the platform, as shown in fig. 1.

Q 2

In order to make use of the telescope for pointing the cannon for day practice, in place of the ordinary sights, it has only to be reversed upon the supports, *b b*, so that the intersection of the cross may be made to bear upon the object to be struck; and in this case the telescope should be provided with marks, *k k*, fig. 6, below the intersection of the cross, or with another similar arrangement giving the degrees of elevation, any one of which, according to the distance, would be brought to bear upon the object to be hit.

Although we have stated that the inventor proposes to use a telescope in conjunction with the collimator, yet considerable advantage may be derived, even if only plain sights are employed. It is, however, greatly preferable to use the telescope, as greater accuracy can be obtained thereby.

TRIALS OF FIRE-ENGINES IN PARIS.

On the 28th of September last, a trial of twenty-three fire engines, in the Paris Universal Exhibition, took place on the banks of the Seine, between the Pont de l'Alma and the Pont de l'Ecole Militaire, in the presence of his Imperial Highness Prince Napoleon, accompanied by the Secretary of the Imperial Commission, M. Arlis Dufour, the Commissioner-in-chief, M. Le Play, and Colonel Nesmes-Desmarest, aide-de-camp to the Prince, and member of the Jury. These trials were, if possible, worse managed than those of the English Exhibition of 1851, the absurd and ineffectual attempt to systematise the experiments on that occasion being entirely omitted in Paris.

Little account was taken, in the French experiments, of the various elements upon which *superiority* must necessarily depend. Even the distances to which the water was projected was only ascertained *by stepping*, no accurate measurements being taken. The exposed and shelving bank of the river was but ill adapted for the trial, and a maliciously high wind blowing at the time sadly marred the fair proportions of the performance, the best engines being necessarily the greatest sufferers. The engines were worked by a party of Sapeur Pompiers, who exerted themselves in a very creditable manner.

The first engine tried, and, as the result proved, the first also in merit, was a London Brigade Fire Engine, named "The Emperor," upon Hadley and Simpkins' patent principle, manufactured and exhibited by their relative and successor, Mr. Merryweather, of Long-acre, London. This engine had two 7-inch pumps, with metal valves in separate valve-chambers and spherical air-vessels, the suction pipe being 3 inches, and the delivery $2\frac{1}{2}$ inches in diameter. Worked by 26 men, it threw a three-fourth inch jet upwards of 120 feet, and its elegant appearance and general performance gave universal satisfaction. An engine of similar construction, "The Prince Albert," in the Hyde-park trials, threw a *$\frac{13}{16}$th inch jet upwards of 137 feet, the greatest range attained by any, except the large* Canadian engine.* In fact, in no trial have Mr. Merryweather's engines been surpassed. Mr. Perry, of Canada, exhibited in the Paris collection an engine of much smaller power than that of 1851. His present engine has two 6-inch pumps only, with a large suction-pipe and an air-vessel thereon, an arrangement that has been much commended, but upon very questionable grounds. Worked by 36 men, this engine threw a $\frac{3}{4}$ inch jet to nearly the same distance as "The Emperor."

The *Times'* correspondent, indeed, gives the first place to the Canadian engine; but on comparing the size of the pumps and the amount of work done with the power employed, this is evidently a great mistake.†

An engine of similar power to "The Emperor," by Mr. Tylor and Son, of London, was next in order; but all attempts to work it were for some time unavailing, and it was passed by as unworkable, when Mr. Merryweather handsomely stepped forward, and upon examination, found the suction-cock turned off; having put this matter straight, he recalled the working party and a trial took place, but the performance was much inferior to that of its rival.

A very pretty ship fire-engine, named "The Admiral," by Mr. Merryweather, could not be tried, in consequence of the branch-pipe having been lost. A farmer's fire-engine, by Mr. Baddeley, of London, was tried, and its performances gave much satisfaction, being far beyond what could have been expected from such a portable and easily worked machine. This engine was commended by the Jurors of the Exhibition of 1851, "for easy access to the valves, the application of a jet-spreader to the nosel, and for simplicity and convenience of arrangement."‡ Mr. Lemoine, of Canada, was also an exhibitor at Paris, and his engine worked well; but, like that of Mr. Perry,

* Vide Jurors' Reports, p, 180.

† As in the Hyde-park trial, Mr. Perry preferred a short, quick, jigging motion, to a full stroke of the pistons, which deprives the experiment of one of the main elements of calculation.

‡ Jurors' Reports, p. 179.

required too many men to work it. M. Letestu, of Paris, exhibited several excellent engines, but none of any great power. Considerable efforts were made to establish a superiority on behalf of M. Letestu's engines, and the *Moniteur* went so far as to assert that the French engine beat the Canadian and English; "whereas," says the *Times'* correspondent, "the fact is, that its performance was the worst of the three." The fire-engines of M. Letestu attracted much notice in the Exhibition of 1851, and a prize medal was awarded him, but the performances were not equal to those of the few English engines that were then tried. The perforated plate valve of M. Letestu has lately been introduced, with much advantage, into the English steam fire-engines. M. Fland's fire-engines (used in Paris) gave much satisfaction; but the metal suction-pipe, with its right-angled sharp turnings, is very objectionable. Several German engines were tried, but their performances were very mediocre; great leverage, slow motions, and contracted water ways, were the distinguishing characteristics of this class. The concluding experiments consisted in pumping the water from five of Letestu's small engines into a large air-vessel (a principle analogous to White's patent), by which means a jet of large dimensions was thrown to a considerable distance.

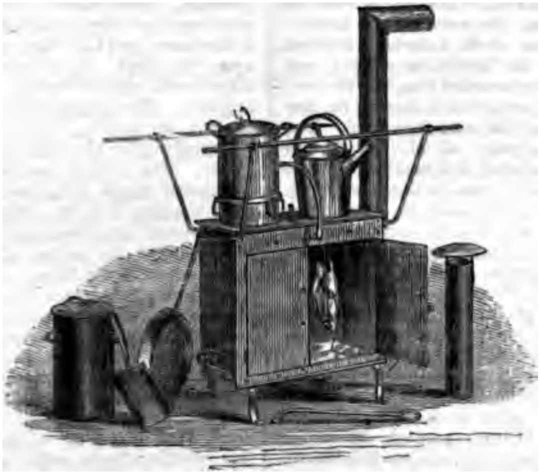
The *Report* of the French commission upon these badly conducted trials is looked for with much curiosity.

NEW STEAM FIRE-ENGINE FOR THE RIVER THAMES.

THE very important services which have, on many occasions, been rendered by the steam floating fire-engine, at water-side fires, have determined the Committee of Management of the London Fire Establishment to provide a second and more powerful machine of that description, and for the future to abolish the use of manual labour in the floating engines. This second machine is nearly completed, and expected to be ready for trial in a few days. The boat is of iron, about 130 feet long, and was built by Mr. Mare at Blackwall. It is fitted with two horizontal double-acting brass pumps, 10 inches diameter, worked by two direct steam cylinders, 14 inches diameter, and 18 inches stroke. Each pump, with its steam engine, is mounted upon a strong iron frame, and placed one on the larboard, the other on the starboard side of the vessel, about midships. Each steam cylinder is provided with a tubular boiler. The air-vessels are of copper, of the balloon form, and of great capacity. They are placed immediately over the pumps, and deliver their water into a 6-inch horizontal main which connects them together, and from which four 4-inch pipes rise through the deck, terminating in screwed elbows, for the attachment of the leather hose. The main can readily be shut off from either engine, and each one of the service-pipes can at any time be opened or closed at pleasure. The leather hose, of which a very large quantity is provided, is 3½ inches in diameter, and has been tested to 100lbs. upon the inch. It is wound upon two large reels placed before and abaft the engines. The pump-valves consist of a large brass grating, upon which is placed a butterfly valve of thick vulcanized caoutchouc. The valve is not loaded, but has a perforated guard plate above to prevent it from opening too far. By this beautiful arrangement the intolerable noise which accompanied the action of the large metallic valves in the former engine, has been got rid of. The power of the engines collectively is 80 horse-power, and may be worked up to 100 horse-power. It is expected they will throw four jets of water, 1½ inches in diameter, or 10 jets of 1 inch each to the usual heights! As the boat, when fully equipped, will draw but little more than 3 feet of water, neither screw nor paddle-wheels could be used as propellers; recourse has therefore been had to a somewhat less efficient but more convenient agent—the jets. For this purpose a centrifugal wheel, or pump, upon Mr. Appold's plan, has been placed behind the engines, and motion given to it by two large driving-wheels; these driving-wheels, when disconnected from the propeller, acting as fly-wheels to the steam-engines, carrying them over the dead centres. The piston-rod of the pump is attached to the piston-rod of the steam engine by a screw coupling, which is readily connected or disengaged. The centrifugal pump is 3 feet 2 inches diameter by 9½ inches wide, and the outlet of each of the two propelling jets is 12 inches in diameter, with the power of reducing them as may be desired. The numerous contrivances to guard against accidents, and to make each part independent of the other in the event of injury, as well as the compact and judicious arrangement of the whole, display much ingenuity and forethought on the part of the designer, James Shand, Esq., of the firm of Shand and Mason, by whom the whole of the engine work has been constructed. The propelling apparatus has been constructed agreeably to the plans of J. G. Appold, Esq., and is confidently expected to give very satisfactory results.

HADEN'S REGISTERED CRIMEAN STOVE.

Mr. J. B. Haden, of Warminster, has recently registered a very compact and useful stove, which has already proved a valuable acquisition to a portion of our camps in the Crimea. This *Crimean Stove*, as it is called by the inventor, occupies but very little space, will burn any description of fuel, will boil a quart of water in four and a half minutes, and at the same time roast, dry apparel, &c.,



and is therefore well adapted for campaigners of every description.

The accompanying engraving represents the stove in use. The fire-box is seen on the left of the oven. From this fire-box the flue leads over the top-plate of the oven to the chimney. There is an aperture in the top of the fire-box, into which is fitted either a tube covered by a lid, for containing a supply of fuel, or a tea-kettle, saucepan, frying-pan, &c. The stove is also furnished with rods, as shown, on which articles to be dried or aired may be hung. These rods are jointed for convenience of packing. The whole of the parts of the stove are, for the same purpose, made to fit into each other.

STEREOSCOPES.

A prize of twenty guineas will be given by the London Stereoscope Company for the best Essay upon the Stereoscope. Arbitrator, Sir David Brewster, K.H. Terms: —The prize will be awarded to the writer who describes in the clearest and most popular manner:

1st. The theory of binocular vision.

2nd. The stereoscope—its character and construction.

3rd. The illustration given by it of binocular vision—and how the TWO flat pictures placed in it appear ONE, and the objects depicted round and solid.

4th. The value of the stereoscope for educational purposes, and its application to the fine and useful arts, giving a comprehensive survey of the subjects embraced by it, showing how the treasures of ancient and modern art, the loveliest scenes and objects of Nature are reproduced in all their reality, grandeur, and beauty: thus affording the most accurate information to the artist and the student, and instruction and delight for the social and domestic circle.

The length of the essay not to exceed 50 pages small octavo (a page of small octavo contains about 360 words.) The writers to illustrate with drawings where necessary. Each essay to be accompanied by an envelope, containing the name and address of the writer, with a motto on the outside corresponding to a similar one on the essay. The essays to be sent to 313, Oxford-street, not later than the 1st December next: from thence they will be forwarded to the arbitrator. The copyright of the essay to be the absolute property of the donors of the prize.

SWISS DRAWING INSTRUMENTS.

We call the attention of draughtsmen to the fact that a Swiss firm is now supplying a London house with drawing-instruments of a superior quality, and at very low prices. Specimens of these instruments having been submitted to us, we have carefully examined both the material and the workmanship, and find them to be in every case much superior to those of any English instruments of corresponding prices that we are acquainted with. We make this announcement with no desire whatever to depreciate articles of home manufacture, but because we think it important that our draughtsmen, who now form a very large class in this country, should be apprised of an opportunity which enables them to reduce their outlay upon what are really, to them, very costly tools.*

NEW THEORIES OF LIGHT AND HEAT.

(*Concluded from page* 346.)

In order further to clear away such general objections as may appear to stand in the way of the theories I am advocating, it will be necessary to notice the means by which "appearances" or the images of objects become visible to our sense of sight; for if light does not come to our earth from the sun or any other visible heavenly body, it will be evident that that theory of vision which supposes that objects are seen by means of different coloured rays of light coming from the object to the eye, must be incorrect.

Amongst the ancient philosophers, even down to the time of Kepler, it was believed that objects are seen by light which is on them, and not by rays of light coming from them, as is now supposed; still, it was thought there must be some kind of connection between the eye and objects, and in the absence of any idea that could be more definitely expressed, they called it "the visual ray."

About Kepler's time, a German philosopher, while experimenting with sheep's eyes, pared away the membranes and tissues at the backs thereof, until he could see the appearances or images of objects delineated on the retina; and he considered this could only be produced by means of different coloured rays of light passing through the crystalline lens of the eye, and, by impinging on the retina, forming the image; on precisely the same principle as the images of objects are thrown by means of different coloured rays of light from the magic lantern.

It will now be my object to prove that this modern theory is erroneous, and that the ancients were correct in supposing that objects are seen by means of light which is on them, and not by light coming from them. At the same time I hope to explain what constitutes that connection between the eye and object which the ancients called the visual ray.

From experiments which I have made, and shall now endeavour to explain, it would appear that the advocates for the undulatory theory of light have been led into error in consequence of not drawing a clear line of distinction between *light itself* and *appearances* which are the *effects* of the action of light on different descriptions of matter. The distinction may be drawn thus:—"Light" is a positive, material, luminous agent, containing latent heat, and capable of producing a chemical change on various descriptions of matter; while "appearances" are only the "effects" of the chemical action of light while in connection with other matter; and as objects become clothed with luminosity or light, they are rendered visible to our sense of sight. I shall now proceed to support these views by experiments.

First. It will be found upon trial that all surfaces are more or less capable of reflecting *light*, whereas *appearances* can only be reflected from surfaces which have a gloss or polish on them. This distinction is not caused by difference in the degree of power to reflect light; but it is a difference in reality; for if two reflectors are made of the same size, the one lined with pure dead-white paper, the other with patent black gloss leather, and placed over candles, it will be found that the paper reflector will under the same circumstances throw off more light than the glossy black leather reflector, although the glossy black leather reflector is capable of reflecting "appearances" very well, while the dead-white paper reflector will not reflect them in the least. The inference to draw from this experiment is, that there is a real distinction between *light* and *appearances*, because the latter requires a distinct description of reflectors; and if *appearances* were reflected by means of rays of light, as is generally supposed, all rays of light would act the same under the same circumstances, and such a distinction could not exist.

Second. If "light" be thrown on any surface, say by means of a convex glass, it can be seen at any angle at which the surface itself can be seen; whereas an "appearance" can only be seen at that particular angle of reflection which corresponds with the angle of incidence. This experiment shows a second distinction between *light* and *appearances*, and adds support to the inference I drew from the first experiment.

* See Advertisement on Wrapper.

Third. "Light" is best reflected in proportion as the surface which reflects it approaches a perfect white; whereas "appearances," on the contrary, are best reflected in proportion as the surface which reflects them approaches a perfect black. This may be proved by placing a piece of common flat glass on two pieces of cloth, the one piece black, the other white, when it will be found that the black ground will reflect the *appearance* of the countenance or any other object, very much more distinctly than the white, and the distinctness will gradually decrease as the colour of the cloth placed at the back of the glass varies from black to white. This experiment seems to carry evidence with it; for if the *appearance* of the countenance, &c., were conveyed to this reflector, and thrown back to the eye by means of rays of *light*, the white ground, from being the best reflector of *light*, ought to be the best reflector of *appearances* also, which is the very reverse of the fact.

Fourth. It is said that the images or "appearances" of objects are conveyed to and thrown on the retina of the eye, and on mirrors, by means of different coloured rays of light, on the same principle as various coloured objects are thrown by means of different coloured rays of light from a magic lantern; but when the experiment is tried, it proves a fact the very reverse of what is stated. If the image of a varied coloured object be distinctly thrown from a magic lantern on a white ground, it will be seen plainly enough; but if the white ground be removed, and a looking-glass substituted in its stead, at the same distance, we lose sight of the varied coloured image altogether, and we only get a faint outline of the image in white light on the surface of the glass; indeed, you cannot throw the image of a varied coloured object by means of different coloured rays of light, so as to be seen in a mirror. And as this cannot be done, I am at a loss to know on what ground the present opinion has been founded; for if we cannot effect this by experiment, when we know that different coloured rays of light are really thrown on the mirror, it appears to me to be most conclusive against the opinion that the images of objects are cast on the retina of the eye, or on a mirror, by means of different coloured rays of light. At the same time these experiments establish the fact that there is, as I am contending, a marked distinction between "light" itself and "appearances."

It may be said, it is impossible that the surface of the moon can be clothed with light by atmospheric combustion, because the moon has no atmosphere. The opinion that the moon does not possess an atmosphere is only based upon the fact, that the appearance of a star is not refracted, when seen through the medium of the moon's atmosphere, while the star is passing behind its body, during what is called an occultation. But this simple fact is very unsatisfactory and insufficient to sustain such an opinion. Indeed the moon's atmosphere cannot possess much refracting power, because there can be but little variation in its density, when compared with the atmospheres which surround other heavenly bodies, for the refracting power of an atmosphere may be proved to increase in proportion as its density varies. If an object be viewed through our atmosphere at 150 yards in altitude, its apparent size will be reduced many times smaller than it really is; whereas, if the same object be viewed through our atmosphere in a horizontal direction, there will be but very little difference between its apparent and real size. This optical effect is produced by difference of density, for when an object is seen horizontally, the atmospheric medium through which it is viewed is of equal density, or nearly so; whereas, when it is viewed perpendicularly, the density of the atmosphere decreases gradually, and its power to optically diminish objects increases in the same ratio; hence, the difference of the apparent and real size of the object in the two cases. Now, as the moon's day is equal to 27½ of ours, and as it only revolves once on its axis during that period, its rate of motion, even at its equator, cannot be nine miles an hour; whereas, the atmosphere of our earth travels more than a thousand miles during the same period of time. Therefore the difference in the amount of centrifugal force in the two cases must be enormous; so much so, that even the solid matter constituting our earth extends eight miles farther from its centre at the equator than it does at the poles, and as its atmosphere travels with it, it must extend much further from the earth's surface at the equator from the same cause, and the density of its atmosphere, and its refracting power must vary between the equator and the poles accordingly; whereas, the moon's atmosphere, from being but very little affected by centrifugal force, cannot vary much in density between its equator and poles. It is impossible, therefore, that it can contain the same amount of optical power as is found in the atmospheres of those heavenly bodies whose centrifugal force is similar to our earth's, and more than a hundred times greater than the moon's.

Again, it is admitted that the surface of the moon contains volcanoes: consequently, there must be oxygen gas necessary to support the combustion to produce them, and there must also be nitrogen gas to check

such combustion, or every thing on the moon's surface would be in a state of conflagration.

Again, Dr. Halley and others clearly saw and described the extent of the moon's atmosphere during an eclipse of the sun; and, were it necessary, I could prove that the copper-coloured flame seen over the surface of the moon, during what is called a total lunar eclipse, is occasioned by combustion going on in the moon's atmosphere, and not by rays of light from the sun being refracted by means of the earth's atmosphere to the moon.

If a connection between the eye and object be considered necessary for vision, Sir Isaac Newton's beautiful theory of gravitation will supply it; for, according to his well established theory, every atom of matter in creation attracts, and in return is attracted, by every other atom; consequently, there is a real connection between all matter, including the eye and every visible object, whether that object be within the compass of my physical grasp, or the most distant star that floats in universal space; and there is no need for supposing rays of light to be necessary, or drawing upon the imagination for a mysterious visual ray.

Again, as sound can only be produced by mechanical action or motive force, so "appearances" can only be produced by the chemical action of flame or light on matter; and if the undulatory theorists will drop *light*, and class *appearances* and *sound* together, considering the first as effects of chemical action, and the second as effects of mechanical action, their theory will apply, and the comparison be proper; for, as there is a sympathy between certain *sounds* and those bodies which are capable of producing and reflecting the same *sounds*, so there is a sympathy between *appearances* and those surfaces which are capable of reflecting them, by virtue of their possessing a gloss or polish; and as *sound* takes time to travel from oné body of matter to another so as to affect it, so *appearances* take time to travel from one heavenly body to another. Hence the difference in the apparent and real time of the eclipses of Jupiter's satellites.

I account for the variations of temperature and intensity of light which exist in different latitudes and various localities, by the great difference in the quantity of atmospheric air existing over the earth's surface in consequence of its diurnal motion; also, by the different descriptions of matter undergoing decomposition, and the difference in the nature and quantities of gas produced thereby; for, as such gas undergoes combustion under the sun's "ignipotent" influence, the light and heat generated thereby will depend on the duration of such influence, and the nature and quantity of the fuel supplied, and vary accordingly; whereas, such variations cannot be satisfactorily accounted for according to the received theory; because, if light and heat really came from the sun to our earth, they would be of uniform power where they impinge on the surface of the earth at the same angle, and not subject to such great variations as are known to exist.

Again, when a ray of light is bent through a convex lens, it is found that the greatest amount of chemical power exists immediately in front of it, and not in the ray of light itself. From this fact, it will be evident that the greatest amount of chemical power must always be before the rays of what is called solar light, in whatever direction they may travel; and if we conceive the chemical power thus found to exist to be caused by the sun's "ignipotent" influence acting through the flame produced in the higher regions of the atmosphere by spontaneous combustion, and that this chemical power acts upon and forms gas from materials existing in the atmosphere immediately beneath the flame, it will follow that this newly formed gas will undergo combustion from being in connection with the flame already alluded to; and, as this chemical power will always continue to descend beneath the flame as it forms, it will continue to produce fresh gas as it meets with fresh materials in the atmosphere during its descent, until it is checked or stopped by clouds or the earth's surface.

Again, all the phenomena of eclipses can easily be accounted for according to the theory I advocate, but more particularly the great difference in the intensity of light visible just before the sun's disc becomes obscured, and after it begins to emerge. Dr. Halley says he could bear to look upon the last limb of the sun for a minute of time before the total darkness; whereas, his eye could not endure the emerging beams from the first instant the disc of the sun began to re-appear; and he speaks of this as *very striking and unexpected*. And Schuhmacher, who, witnessed another total solar eclipse, says, "Blue pale vapours formed in the east during the eclipse, and they burst forth as a mighty conflagration the instant the sun began to re-appear." This may easily be accounted for by the fact that a quantity of gas would be produced from the aqueous vapour and effluvia during the *temporary* but *sudden* suspension of the sun's "ignipotent" influence; and such gas would blaze forth the instant it was affected by

the "ignipotent" action of the sun on the commencement of his re-appearance.

From the above facts and explanations we may also infer that the dazzling appearance of the sun to our eyes is principally, if not wholly, occasioned by our being compelled to view him through such an immense body of flame as exists in our own atmosphere.

Were it necessary, I could notice several other particular points that would strengthen the discovery I am advocating; but, believing I have said enough to enable a person to comprehend and form an opinion on the subject, I shall content myself with a few general remarks by way of conclusion.

I trust I have made it clear that light must always be the result of combustion, and that the earth's atmosphere is composed of such gases as are suitable for the production of all the light and heat it receives, and that these gases cannot be reduced in the atmosphere by any other means than by combustion; and seeing there are thousands of millions of tons weight, and millions of millions of cubical miles of this gaseous matter around the earth, whose atmosphere may be considered as its great gasometer, which also contains a vast amount of latent heat, I will ask, if it is not very inconsistent to suppose we are depending on a body 95 millions of miles distant for light and heat, when we have all the materials necessary for the earth's illumination in its own immediate neighbourhood.

Again, I have shown that if the sun were to supply the solar system with light and heat, it must rapidly be expending itself, and the solar system would be thrown into confusion in consequence; whereas, according to the theory I advocate, the harmony of nature could never be disturbed, and it would serve to manifest to us more completely the infinite wisdom of Him who possesses infinite power; for under such an arrangement the inhabitants on the planet Herschel may be as warm and comfortable as the inhabitants on the planet Mercury, and the inhabitants of this latter planet may be as cool as we are in our own temperate climate; and even the inhabitants on the sun itself, instead of being under the immediate influence of a white-hot fire, may not feel the heat so much as the inhabitants of our torrid zone, but may actually be as cool and comfortable as we in this latitude.

I will only further observe that the appearance of the heavenly bodies themselves confirm the discovery I advocate; for each is evidently enveloped in its own separate and distinct flame, which corresponds with their globular form, and extends but a limited distance from their surfaces, as we see them shining in the heavens; and there, unlike our artificial taper-specks, those natural lambent flames are oceans of liquid fire, enveloping one-half or more of distant worlds, each, as it turns within its concave blaze, throwing in fresh fuel, and, in return, receiving heat and light for constant change.

WINCH HANDLES.

To the Editor of the Mechanics' Magazine.

Sir,—The remarks in your last number, in answer to Mr. Truran, upon the Windlass Question, have reminded me of some experiments which I made several years since, in endeavouring to employ a platform which I have for raising carriages from the ground-floor of my factory to the lofts above, as a rough substitute for a weighing-machine.

The platform referred to is raised by means of four ropes winding upon a barrel 7 feet long, 9 inches in diameter, having a 8-feet spur wheel upon each end, actuated by 3-inch pinions; the pinion shaft being of the same length as the rope barrel, and having a 20-inch winch at each end. I used two of Salter's spring balances, and found that one pound upon each winch was about equal to one hundred weight upon the platform; but as the friction increased very rapidly with the increase of weight, owing to the disadvantageous manner in which the ropes were conducted from the platform to the barrel, the machine was of little use for the purpose of weighing. I arrived, however, at one result, which has some bearing upon the question at issue between you and Mr. Truran, of the *Franklin Journal*.

Applying a spring balance to each handle, as close to the cranked part as possible, the weight of the platform (assumed to be 8 cwt.) produced a pressure of 8 lbs. upon each, =16 lbs.; but when one of the "balances" was taken away, the pressure indicated upon the remaining one was 18 lbs.; and when the "balance" was placed at the extremity of the handle, 18 inches from the crank, the pressure was 19 lbs. Here, then, was a difference, of 3 lbs. in 19 lbs., caused by varying the position of the force applied to perform a certain amount of work.

It should be mentioned, that the winches are both in the same plane, and not at right angles to each other, as in Desagulier's proposition; they give, however, the same advantage in the application of manual power, one man's strength being at its best when the other's is at its worst. The ratios of difference in the two cases are remarkably similar; that of Desagulier's being as 35 to 30, mine as 38 to 32.

It seems obvious that in the case which I

have stated, the 3 lbs. of power are lost through the elasticity of the winch and the torsion of the long pinion shaft. Similar results would, doubtless, be found, though in a less degree, with an ordinary windlass having a short shaft, and the difference when one winch only is used would probably vary with the position of the rope upon the barrel at any given moment, there being most torsion when the rope is travelling upon that part of the barrel which is farthest from the winch, and *vice versâ*.

The well-diggers in these parts use a slightly curved wooden handle to their bucket windlass, instead of the usual cranked handle or winch, and say they can do more work with it. I have no doubt they are right, for they apply their power much more nearly in the plane of the resistance than they would do with the ordinary cranked handle.

I am, Sir, yours, &c.,

JAMES ROCK, JUN.

Hastings, Oct. 15, 1855.

HYDRAULIC FORMULÆ.

To the Editor of the Mechanics' Magazine.

SIR,—Can any of your correspondents inform me, through the medium of your valuable periodical, whether or not there is a formula, and if so, where can it be found, for calculating the height to which water will rise above a jet, having the head given, and diameter of orifice in the main, or the length and diameter of pipe, which constitutes the jet rising above the main? For example: Let the head be 100 feet, diameter of main 6 inches, orifice ½ inch; and, also, ½ inch pipe 8 feet long, rising above the main.

Question.—How high will the water rise above the orifice, and also above the top of the pipe?

Again. What distance would the water be carried from the main if the jet pipe were placed at an angle of 45 degrees?

Some short time since I saw in your Magazine a formula of Mr. Hawksley's for calculating the velocity of water through pipes. I should like to know if the various formulæ of Mr. Hawksley are published in any work, and if so, where? Also, where I can find a formula for calculating the height to which water will rise, or can be raised by the hydraulic ram, having the head or inclination, and diameter of main given, as well as the diameter of pipe through which the water is to be raised? A few plain formulæ for the above, or directions where to find them, would much oblige.

I am, Sir, yours, &c.,

AMATEUR.

Oct. 16th, 1855.

ON THE FORM OF THE MOON.

To the Editor of the Mechanics' Magazine.

SIR,—Will you have the kindness to find room in your valuable columns for the two following submissions:

Suppose some such body as the moon to be perfectly spherical, covered all over with water, having a rotary motion on its own axis projected into free space, and to come within the influence of a much larger body, and just at such a distance that it would commence to perform a revolution round its primary in the same time that it took to rotate on its own axis. There would immediately arise two tides on its surface, the radius vector passing through the highest point of each. These tides would always remain in the same places, and if they were to freeze, we should then have the satellite a solid mass, of an egg or spheroidal form. Now, I submit, that if the moon has been in a plastic state while subject to her present circumstances, her form must be spheroidal, her longest diameter passing through the earth. Two things must result from this; *first*, her bulk will beg reater than we have estimated it to be; *second*, the eccentricity of her orbit will be less, as it will require less libration to expose a given amount of new surface on a spheroid, so circumstanced, than on a true sphere.

Might we not reasonably expect to discover a double or even triple asteroid?

I am, Sir, yours, &c.,

J. SIMON HOLLAND.

October 11, 1855.

THE PROJECTILE AND ASTRONOMICAL CONTROVERSY.

SUN'S APPARENT DIAMETER.

To the Editor of the Mechanics' Magazine.

SIR,—The objections I have hitherto taken to Mr. Hopkins's observations at the tropics are by no means all that might have been found. My chief object was to show (putting the observations themselves on one side) that he had utterly failed in the very first duties of a propounder of a new doctrine, in establishing any rational ground for its reception.

It is not my intention *now* to make any further remarks on Mr. Hopkins's results, as I am satisfied that my *à priori* objections must be met before there is any necessity for a further discussion of the subject.

The few words with which I wish to trouble you now are suggested by the letter of "I. M. E." in your last number.

Agreeing, in the main, with that gentleman's observations, I must yet suggest to him the inconvenience of departing from the received definition of the *apparent diameter* of the sun, which he does in his calculation. For all I know to the contrary,

Mr. Hopkins commits the same error; but in a discussion of this kind, it is most important that no technical term should be used in any other sense than that which has been conventionally accorded to it.

In the language of astronomical science, the diameter of the sun is the actual diameter of the spherical body itself, and is therefore incapable of change. The apparent diameter is the *true* angle subtended by the sun's real diameter at the earth's centre. What is directly observed, therefore, is not the true *apparent* diameter of the sun, but that angle subject to the usual *astronomical corrections*. Thus if A and a are the *observed* altitudes of the sun's upper and lower limbs, and R and r the corrections for refraction corresponding to those angles, then $A+R$, $a+r$ are the true altitudes (correcting for *refraction only*) and $(A+R-(a+r)$ $=A-a-(r-R)=$the sun's true *apparent* diameter. It is evident that if the magnitude of this angle be correctly ascertained, and be found subject to change at different periods of the year, since the sun's diameter is invariable, this change can only be due to a variation in the only other element which enters into this case, viz., the distance of the earth from the sun. The *observed* apparent diameter might be subject to variation without our being able to draw this conclusion.

It strikes me at present that a great deal, if not all, of what Mr. Hopkins has written in his paper on the "Optical Illusions of the Atmospheric Lens," has reference to the *observed* and not to the true apparent diameter.

However, the great obscurity which shrouds all his explanations prevents my being able to speak positively on this point.

I am, Sir, yours, &c.,

W.

London, Oct. 16.

FIRST LAW OF MOTION.—ACTIVE FORCES.

To the Editor of the Mechanics' Magazine.

SIR,—"W." in his last letter still maintains that "the *experiments and observations* on which the first law of motion is based, are fully set forth in all sound elementary works on mechanical science," &c.

To use "W.'s" own words, "of assertions we have had enough and to spare—what we want is proof." I requested "W." to favour us with *one single* instance by which this law has been proved by *experiment* and *observations;* that is, to prove the existence of a perpetual motion—that is, a body moving uniformly without being propelled by a constant uniform power.

Mark his reply and his attempt at demonstration. He states, "It is very true we have no experience of motion in free space, because the earth is everywhere surrounded by a medium whose resistance alone would in time reduce every body to rest. But I will give one illustration, among many which might be found of a body moving uniformly under conditions which are strictly analogous to the case of *no force acting.*

"When a railway train has acquired such a velocity that the mean thrust exerted by the engine to propel the train is exactly equal and opposite to the friction of the wheels, together with the resistance of the air, it is an *experimental fact* that the railway train moves uniformly with this velocity." * * * "According to our first law of motion, it *ought* to move uniformly; according to experiment, it *does* move uniformly.

"Were any law but the first law true—that is, were there a tendency in a body to retard its own motion, *then*, under the circumstances supposed, the motion of the railway train *could not* be uniform. Here is a case for our engineering philosophers to expend a little of their ingenuity upon!"

This is, indeed, a most extraordinary mode of attempting to prove the first law of motion. If the first law of motion—that is, that a *body moves uniformly without a constant force acting on it*—has no better than the above illustration to support it, the question need not be further discussed. Is not "W." aware that a train going at any given uniform velocity, requires a certain amount of steam constantly to keep it going at that rate, in addition to that required to overcome the resistance of the atmosphere and the friction, and that for any increased uniform velocity—say from thirty to forty, or fifty to one hundred miles per hour—an additional amount of steam would be required and consumed, to keep up such velocity, besides the extra steam required for the extra resistance? How then can he make out that the train moves *without any such acting force,* when it goes at a given uniform velocity? I beg leave to inform him that our consumption of steam, whether in locomotives, marine engines, or any other machinery, is not solely dependent on the amount of friction and resistance, but also, to a much greater degree, on the rate of the *velocity.*

Had "W." been an engineer, he would have been acquainted with the difference in the amount of cost for fuel in working at slow and great velocities, and he would not have made such a grave error as to suppose that a train could move at an uniform velocity without consuming steam power, in the ratio] of that velocity. I beg to inform your correspondent that, "The *power*

multiplied by the *space* through which it moves in any given direction, must be equal to the *weight* (total resistance) multiplied by the *space* through which it moves in a corresponding direction." This great principle in every description of moving forces may be considered as the *golden rule* of mechanics, and therefore the guiding principle of all engineers. Indeed, I may say that it embraces the whole science, statics and dynamics; and equally includes the resolution of all problems respecting bodies, or a system of bodies, in equilibrium and motion.

Dr. Lardner and others, some years ago, were under the impression that if a train were allowed to run down a slightly inclined railway, it would continue to run with an accelerating velocity. On making the experiment, they found that the train, on attaining a certain velocity, continued afterwards at an *uniform speed*. They found that at a certain rate of velocity, with the friction of the wheels and the resistance of the air, the propelling gravitating power was exactly balanced; hence the cause of the uniformity—and on arriving below on the *level railway*, and losing the gravitating force, the train moved on at a decrescent velocity until the force of the momentum of the train was finally consumed, and then it necessarily stopped.

The rate of sailing vessels depends on the area of the sails and the intensity of the wind. The movement of balloons and the clouds are also dependent on the currents of the air. All moving bodies with which we are acquainted are under the influence of some moving force; without the aid of the latter, no one yet has been able to effect a perpetual and uniform motion. We see, it is true, perpetual movements in the works of the creation, such as the constant currents of magnetism that sustain our magnetic needles—the currents of the ocean from the south, such as the Gulf Stream—the periodical tidal wave—the annual renovation of the vegetable kingdom — and many other phenomena which are within our reach; but no one would presume to say that they proceed from a mere mechanical impulse. They are the effects of constant active causes; and why should not the planets and all the heavenly bodies be governed by similar retaining and moving forces, instead of mere accidental and imaginary mechanical impulse?

Astronomers long since have had sufficient reason to believe that the solar system is filled with a resisting medium, and that there is no proof of the existence of a vacuum or empty space. Even were it possible to produce a circle by a tangential impulse and a centripetal force, a resisting medium would destroy its uniform continuity. For my own part, I believe that the planets are retained in their respective orbits by the solar medium (just as a balloon or the clouds are retained at certain distances from the earth according to their densities), and that the whole system is propelled by the circular currents generated by magnetic rotation. We can prove that a magnetic body, if suspended on a centre, will rotate on its axis, and this rotation agrees with the direction of the rotation of the earth with reference to its poles. All the movements of the heavenly bodies are in strict conformity to such an action;* but, be this as it may, what I contend is, that it cannot be demonstrated that they move without some continuous force, and that "W." has not yet been able to bring forward one single case to support the doctrine of perpetual motion, or, which is the same thing, a body moving uniformly without a constant propelling force.

I am, Sir, yours, &c.,
EVAN HOPKINS.

P.S.—If "W." cannot determine the path of a projectile by the elements given, viz., an ascending decrescent velocity, combined with a descending increscent one at any given angle, he is no geometrician, and it would be of no avail to occupy your pages on the subject. To attempt "to convince a man against his will," would perhaps be an endless task, more especially when we find neither explanations, diagrams, nor facts founded on direct observations, are of use to him. Real matters of fact do not require lengthy arguments, nor symbols and complicated formula to make them evident to those who wish to learn. It is the doubtful hypotheses that require such aid, which is usually given to render the original conception of the thing itself in dispute as invisible as possible.

E. H.

38, Thurloe-square, Oct. 15, 1855.

ON THE OPTICAL ILLUSION OF THE ATMOSPHERIC LENS.

To the Editor of the Mechanics' Magazine.

SIR,—It would perhaps be unfair to criticise too severely the remarks of your correspondents "W." and "I. M. E." on this question before they fully comprehend my observations and explanations. Probably the want of diagrams has given rise to the confused manner in which they have discussed this subject; therefore I shall feel obliged by your inserting the diagrams this week, so that "W.," at least, may under-

* See "Hopkins' Geology and Magnetism," Second Edition, chap. xxviii.

stand the meaning of "two opposite horizons" in the equator—say one in Singapore and the other near Quito (12 hours difference in time), where the sun may be seen setting in the former and rising in the latter in the same instant of time—that is, 6 P.M. and 6 A.M., as described in the diagram.*

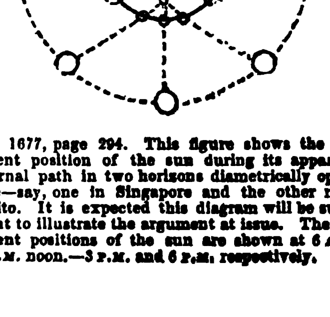
"I. M. E.'s" letter shows very clearly that he does not know how the diameter of the sun is measured. He talks of *the altitude of the lower and upper limbs* as if that was the mode of measuring the diameter of the sun, and then proceeds, according to *his* notion of the effects of refraction, to show that a matter of fact cannot exist, and that, instead of an increased apparent diameter near the horizon, celestial objects *must* appear less! A mere glance with the naked eye shows the contrary. I beg to acquaint "I. M. E." that the measuring of the apparent diameters of celestial objects is much more delicately and accurately done than by taking the altitudes of the two limbs; and I would recommend him to take a few lessons on the subject before he ventures to question the truth of careful and extensive observations, and draw false conclusions therefrom. We have to measure the diameter of the sun *horizontally* as well as vertically. This is done by passing over the disc the reflective image from one side to the other, delicately adjusting the contacts, and thus taking double diameters, which, when divided by two, give the exact diameters, free from the errors of the instrument.

At the last meeting of the British Association, Sir D. Brewster made the following very just and appposite observations on persons disputing questions with which they were not sufficiently acquainted:—" Dr. Whewell," said he, "who had never made an experiment on the subject, and the Abbé Moigno, who was equally guiltless of using a prism .... being unwilling that Newton's analysis of the spectrum should be regarded as incomplete, denied the existence of a triple spectrum. It was in vain to reason with antagonists of this kind; and this was one of the occasions when hard-working men of science have to regret that the history of their labours has been given by individuals who have not *wrought* in the same field;" and I may add, who are generally biased to old theories, and therefore extremely prejudiced against discoveries that tend to upset their former notions. Dr. Young, with his undulatory theory of light, was exposed to most virulent attacks in the *Edinburgh Review*, and from many mathematicians, for upwards of twenty years. His theory had to go to the continent to be accepted before it could be countenanced in England! Such is the fate of all new discoveries, excepting those which are more immediately connected with the progress and economy of our national industry; and this is the reason why there is such a wide and almost impassable gulf between the physical theories of mathematicians and those applied to our manufactories, &c.; the latter are improving and progressing, whilst the former remain behind.

If "W." will refer back to my paper, he will find my apparent diameters of the sun are in accordance with the *observations* made on the sun's apparent diameter *from Greenwich*, from June to December, and are not, as he states, different. I could name a host of naval and other captains, besides Captain Smith, who have observed the same variable diameters as I have stated, but who, rather than waste their time in writing, and try their patience with mere presumptuous school-boys, who do not believe that anything can exist but what their professors tell them, prefer leaving the question as it is.

At a late scientific meeting, in a discussion on one of Sir Edward Belcher's papers on the Arctic regions, a person who had never been out of England disputed the facts brought forward, and endeavoured to make out that he knew the state of the Polar region better than the author of the paper! "W." may probably belong to the same class, and will still persist in asserting that the world is not as we see it, but as the professors have created it. It is useless to discuss with persons who prefer the imaginary to the reality. Some time ago a professor gave what is commonly called an able

* A diagram to illustrate my paper "On the Optical Illusion of the Atmospheric Lens," in



No. 1677, page 294. This figure shows the apparent position of the sun during its apparent diurnal path in two horizons diametrically opposite—say, one in Singapore and the other near Quito. It is expected this diagram will be sufficient to illustrate the argument at issue. The apparent positions of the sun are shown at 6 A.M. 9 A.M. noon.—3 P.M. and 6 P.M. respectively.

lecture on the theory of the tides. However, a sea captain, who was not over satisfied with his description of the meridional swell of the ocean, &c., told the professor that there were no such tides in the Pacific nor in the Caribbean Sea. "I cannot help that," the professor said, "but they *ought* to be there!" The captain asked him again how was it that the Red Sea had tides, but the Mediterranean Sea none? "Oh," he replied, "the beauty of this theory is, that the disagreement even proves the truth of the theory!"

After confessing and acknowledging the various so-called mathematical theories which have fallen into disrepute referred to by "Civil Engineer," "W." very justly concludes by stating that, "Newton may be almost said to have furnished the instruments for the subsequent overthrow of his own theory of light," &c.; and I may also add, that had his laws of optics been properly applied to refraction and the sun's variable apparent diameter, the orbit would not have been made an ellipse, nor would astronomers maintain, as they do now, that the moon had no atmosphere, because she does not exhibit a similar kind of refraction to that which we see on earth.

More of this when your correspondents have sufficiently comprehended the question at issue. In the mean time I maintain the correctness of my observations, as recorded in your Magazine.

I am, Sir, yours, &c.,

EVAN HOPKINS.

38, Thurloe-square, Brompton, Oct. 15th.

LAWS OF MOTION—PRE-GALILÆAN MECHANICS.

To the Editor of the Mechanics' Magazine.

SIR,—In this controversy the matter *really* in dispute seems to be not the *first* law of motion, but the *third*. The first law of motion (so called) is rather a *definition of the word "force"* than a law or statement of fact; for it may be put in the following form:—"*Let every cause which changes, or tends to change motion, be called a* FORCE." This form of words simply assigns the sense in which a term is to be used, is not open to controversy as being *true* or *false*, and can be objected to only on the ground that the term "FORCE" might be better employed to denote something else, or that some word other than "*force*" would answer better as an equivalent for "*cause-of-change-of-motion*." As, however, the above mode of using the term "*force*" is almost universal amongst mechanical writers, I shall in this communication adhere to it.

The second law of motion may be put in this form:—"*The change of motion produced by a combination of forces is the resultant (or geometrical sum) of the several changes of motion which the several forces constituting the combination would respectively produce if each such force acted separately.*" Now this is a *law*, properly speaking, or a statement of a general fact, as being the result of experiment and observation; but, so far as I can judge, this law has not been called in question.

The third law of motion—"*Action and reaction are equal and opposite*"—is equivalent to saying, "*All forces are mutual*," or "*All causes of change of motion are actions* BETWEEN *bodies*;" so that whenever there occurs a change, or a tendency to change, in the state of one body, A, as to motion, there occurs simultaneously an equal and opposite change, or tendency to change, in the state, as to motion, of some other body or system of bodies, B; the force, or cause of such changes or tendencies, being a mutual action *between* the body, A, and the body or system of bodies, B.

This also is a *law*, properly speaking, or a statement of a general fact, as being the result of experiment and observation. It is true that some of the demonstrations of this law have, at first sight, the appearance of proofs *à priori*; for example, Newton's, who shows that the equality of action and reaction is essential to the permanent existence of the physical universe, such as we see it; but, on further consideration, it will appear that even this proof is inductive, substituting only general observation of the phenomena of the universe for special experiments.

So far as I can understand the controversy which has been for some time carried on in your Magazine, it is, in point of fact, this law of action and reaction which has been called in question. One party appears to me to say, "The diminution of the horizontal component of the velocity of a projectile is caused by a mutual action between it and the surrounding air; the motion which is lost by the projectile is gained by the air; and if there were no mutual action between the projectile and the air, the horizontal component of the velocity of the projectile would continue undiminished until the projectile struck the earth or some other body." This is, in fact, an application of the law of action and reaction, according to which there can be no change in the motion of the projectile except by an action between it and some other body.

The other party appears to me to say, "There is a tendency in the horizontal component of the velocity of the projectile to diminish, independently of any actions between the projectile and other bodies;"

in other words, *there is an inherent retarding force* (or cause of diminution of motion) *in the projectile itself, having no connection with mutual actions between bodies;* so that the law of action and reaction is false, or, at all events, false as regards terrestrial projectiles. And the opinions of this party to the controversy may be regarded as forming part of a system of mechanics, from which the law of action and reaction is either wholly or partially excluded, and which bears some resemblance to the mechanics of the *pre-Galilæan* scholastic writers.

In the preceding attempt to reduce the "Projectile Controversy" to the narrowest possible compass, I have endeavoured to state the opinions of others of your correspondents in my own words. If I have in any instance failed to represent those opinions accurately, my statements are open to correction, whether by the pre-Galilæans or by the Galilæans.

I am, Sir, yours, &c.,

O. P. V.

October 15, 1855.

THEORY AND PRACTICE.—ASTRONOMICAL OBSERVATIONS—PLANETARY ORBITS.

To the Editor of the Mechanics' Magazine.

SIR,—The controversy which has been recently carried on in your pages with regard to the experiments and views of Mr. Hopkins, is an example of that tendency to oppose and depreciate one another, which is so often found in the two great divisions of scientific men—those who have directed their attention principally to experimental, and those who have directed it principally to theoretical investigations.

Now, as this feeling is very injurious, hindering that union of theory with practice, and that cordial co-operation between the two classes, which affords the best safeguard against error, it is advisable, for the settlement of such discussions, to use language and methods of demonstration that will be clear to both parties, and will not wound the prejudices of either. This, if you do not think the questions are already settled with sufficient clearness, and are willing to spare some of your valuable space for the purpose, I shall endeavour to do.

Absence from England prevented my seeing the commencement of the discussion; but the case seems to be this:—An accurate observer, residing in districts peculiarly favourable for such investigations and employing good instruments, has made an extensive series of observations, which have been confirmed by those of some of his friends, and from which it seems that the allowances for atmospheric refraction in the "Nautical Almanac," and, by inference, those generally made by astronomers, are erroneous. In accordance with his new data, he has assigned a new figure to the earth's orbit, and then considers it sufficiently proved, that all astronomical conclusions, and the observations and primary laws upon which such conclusions are based, are unworthy of confidence; and his followers, going beyond this, propose certain experiments by which to establish other laws in their stead.

These observations, if really made with better instruments and under new circumstances, are valuable, and deserve careful consideration; so that either the difference between his results and those of others may be explained, or fresh observations may be made on the subject; but they are totally insufficient as grounds for the sweeping conclusions, in support of which they are brought forward:

1stly. *Because we have no minute description of his instruments, such as might induce us to trust to them rather than those which have been used by astronomers;* and that with regard to variations of angular magnitude much too small to be seen by the naked eye.*†

And, 2ndly. *Because the vast majority of the astronomical views, which he would set aside, refer to periods which are not annual, and which, consequently, could not be affected by an error in estimating the annual variation of the atmospheric refraction.*

With regard to the first points, astronomers have before had to meet the objection, that observers could not detect changes, which must take place if their theories were true. It was said, for instance, that the Copernican theory must be false, because Venus did not show phases like the moon, until those phases were revealed by the telescope. It was said that the earth must be stationary, because no parallax could be seen in the fixed stars; and when at last, by instruments of increased accuracy, motion was detected in the latter, it was found to be the reverse of what theory indicated. Bradley, however, did not rest satisfied with observing the discrepancy; and thinking that he had overturned all the results at which former astronomers had arrived, he set to

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* Who have made observations, in which erroneous allowance for refraction must have been detected, in both hemispheres, and in the tropics; as, for instance, at the Cape, Tahiti, South and Central America, Cincinnati, &c.

† The difference which the estimated excentricity of the earth's orbit would make in the apparent diameter of the sun is about the same as the apparent diameter of the planet Venus.

work to trace it to its source, and was rewarded by the discovery of the aberration of light: and now instruments still more delicate have shown a real parallax.

Supposing the experiments of Mr. Hopkins shown to be more worthy of confidence than others, and that their results could only be explained by the orbit of the earth being circular, the stability of the systems of Kepler and Newton would still remain unaffected. Astronomers have already calculated, without thinking such an event would overthrow their systems, that, after the lapse of a certain time, the earth's orbit will become circular. They have felt no alarm at this, because NEWTON HAD SHOWN, NOT THAT AN ORBIT MUST BE AN ELLIPSE, BUT THAT IT MUST BE A CONIC SECTION.

With regard to my second point, the excentricity even of the earth's orbit has been measured independently of the sun's apparent diameter, it is shown magnified, as it were, in the variations of the moon's motions; and the accuracy of La Place's calculations on this subject is proved by their harmonizing the observations of eclipses made in all parts of the world, and from the earliest periods of history.

But I will not insist on this, as it is simpler to show that the alleged erroneous allowances can in no way affect the calculations for the orbits of the other planets, since their variations are not annual. Take Mercury, for instance. Not only is the excentricity of his orbit many times greater than that assigned to that of the earth, so that they could not both have been the result of one common optical delusion; but, as his revolution only takes about a quarter of the time that ours does, two revolutions would bring him to the same part of his orbit at opposite seasons, and so reverse the effect of the annual variation of refraction, and not only free the calculation from errors arising from it, but afford us a means of accurately estimating its amount.

Similar reasoning might be used with regard to the other planets, and so the foundations of the old system are untouched. Let us now turn to those of the new.

The experiments proposed possess no particular novelty, either in nature or in arrangements for securing accuracy; they simply fail to show the undisturbed action of the received laws of motion, because *an air-pump will not produce a perfect vacuum or perfect freedom from friction*; there is always some air unextracted. But, so far as they go, they support the received laws; for they show that, according as the vacuum becomes less imperfect, the results obtained differ less from what the undisturbed action of those laws would produce.

If, as I hope, I have succeeded in clearing the subject of difficulties which mathematical arguments failed to remove from some minds, I may remark, in conclusion, without giving offence, that it is best to strive to reconcile discordant data rather than make them the basis for conflicting theories; that it is dangerous to slight any source of knowledge, and especially that we should well study the foundations of any system that we may endeavour to overthrow.

I am, Sir, yours, &c.,

J. E. NELSON.

Twickenham Common, Oct. 16, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

LOWRY, GEORGE, of Manchester, machinist. *Improvements in lubricators.* Patent dated March 19, 1855. (No. 606.)

This invention consists in so constructing lubricators that the supply of lubricating material contained in a revolving plug shall not be discharged on the article to be lubricated at every revolution of the said plug. Also in improved modes of regulating the quantity of lubricating material in the revolving plugs of lubricators, and of giving motion to these plugs.

FAYERMAN, EDMUND REYNOLDS, of Pall Mall, Middlesex, gentleman. *Improvements in portfolios for holding papers.* Patent dated March 19, 1855. (No. 608.)

By giving access to the back of the portfolio, and adjusting the strings and holders, the inventor proposes to afford facility for inserting papers, holding them without making holes, removing them without disturbing those already inserted, and inserting them in any parts of the portfolio, or within other papers therein.

SCULLY, VINCENT, of Dublin, Esq., and BENNETT JOHNS HEYWOOD, of the same place, gentleman. *An improved mode of regulating the supply of gas to gas-burners* Patent dated March 19, 1855. (No. 610.)

The inventors propose to control the amount of gas that shall be delivered to any particular burner by inserting, out of sight, in the gas passage, a regulator which will limit the supply of gas to what is really necessary to produce the requisite amount of illumination for the time being, without permanently reducing the illuminating capacity of the burner.

ROEHRIG, PHILIPPE, of Paris, France. *A new or improved alimentary substance.* Patent dated March 19, 1855. (No. 613.)

This substance, which is particularly intended to be used when preparing pottages, soups, and broths, consists of the blood of edible animals, purified or refined, boiled rice, feculæ of potatoes, or mashed potatoes, and flour; these various ingredients being

thoroughly mixed with each other, and with any other suitable substance.

CRUDNER, LOUIS HENRY, and FREDERIC LOUIS KOEBRIG, of Tottenham-court-road, Middlesex. *An improved apparatus for purposes of ventilation.* Patent dated March 19, 1855. (No. 614.)

The inventors place a tube or funnel, of any suitable material, in any convenient situation, so as to form a communication between the interior of the apartment and the external atmosphere, and in connection with this tube or funnel adjust a fan-wheel or blower which is caused to rotate by the intervention of any self-acting mechanism.

SMALLEY, JOHN, of Bishopgate, Wigan, Lancaster, accountant. *Improvements in railway carriage axles.* Patent dated March 19, 1855. (No. 615.)

Claim.—A mode of "constructing a compensating axle (or axle admitting different rotative velocities in the near and off side wheel of the same axle) the said axle or axles being solid through the wheels, which are keyed or otherwise fastened thereto, so as to rotate therewith."

HODGES, RICHARD EDWARD, of Southampton-row, Middlesex, and CHARLES MURRAY, of Manor-place, Walworth, Surrey. *Improvements in door springs.* Patent dated March 19, 1855. (No. 616.)

This door spring is so arranged, that the power of the apparatus should become greater just at the moment of closing, so as to overcome the spring-bolt of the lock; a lever is fixed on the door, and a short chain, strap, or cord is attached at one of its ends to the door frame, and at its other end to the outer part of the lever. To the same end of the lever is attached a spring, by preference of vulcanized India-rubber, and the other end of the spring is attached to the door. When the door is arranged to open in two directions, then two levers and two springs are used, one of the levers coming into action when the door is opened, and in one direction, and the other coming into action when the door is opened in the other direction.

TERRY, ALEXANDER ROBERT, of Adelphi-terrace, Adelphi, Middlesex. *Improvements in apparatus for copying letters and other documents.* Patent dated March 19, 1855. (No. 617.)

This invention is described on page 342, of our last Number.

SMITH, WILLIAM, of Little Woolstone, Fenny Stratford, Bucks. *Improvements in ploughing or trenching and subsoiling land.* Patent dated March 19, 1855. (No. 618.)

This invention consists in combining subsoil ploughs with trenching or double mould board ploughs, in such manner that part of the framing will, when required, by the aid of wheels, cause the ploughs to be raised out of the land.

MUSGRAVE, JONATHAN, of Bolton-le-Moors, Lancaster, engineer. *Improvements in steam engines.* Patent dated March 20, 1855. (No. 620.)

Claim.—"The application to condensing steam engines of a second condensing cylinder connected to the beam on the connecting-rod side of the beam centre."

TAYLOR, WILLIAM, of Poolstock, Wigan, Lancaster, picker manufacturer. *Improvements in the construction of pickers for power looms.* Patent dated March 20, 1855. (No. 621.)

In carrying out this invention, the inventor combines two sets of pieces of compressed hide, one set called "edge-pieces," the other "wrapping-pieces." The upper end of the edge pieces project a little beyond the wrapping pieces, so as to form the grooved piece, or end which works within the slide groove, and the wrapping pieces extend below the lower edge of the edge pieces, to allow of their being bored for the slide rod, and of a slot being cut therein for the strap without coming in contact with the inner edge pieces. The whole is fastened together by clenched rivets or otherwise.

FELL, THOMAS MARA, of King William-street, London, and FRANCIS SQUIRE, of the same place, civil engineers. *Improvements in balance levers, and apparatus for weighing, and modifications thereof, for the purpose of detecting base coin.* Patent dated March 20, 1855. (No. 622.)

This invention consists in adjusting the levers and fulcra of such apparatus according to the results of certain mathematical investigations.

MARSDEN, CHARLES, of Kingsland-road, Middlesex, ventilation engineer. *An improvement in tent poles.* Patent dated March 20, 1855. (No. 624.)

This invention consists in forming tent poles hollow, and in perforating their sides or circumferences, or otherwise making apertures therein, so as to afford ventilation. The improved poles are provided with a cap for preventing the entrance of rain, &c., and also with means by which a portion of the ventilating apertures may be closed.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *A new and improved governor for engines and machinery.* (A communication.) Patent dated March 20, 1855. (No. 628.)

Claim.—"The combination of a speed governor with a resistance governor, in such manner that each shall exert its own proper effect upon the motive power, producing thereby a compound regulation, without either of the said governors interfering with the action of the other."

ROGERS, ISAAC, of North Haverstraw, New York, United States of America. *Im-*

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provements in the mode of treating iron ores. Patent dated March 20, 1855. (No. 629.)

This invention "consists in the use of a revolving deoxydizing cylinder, heated to the required degree by a reverberatory or other furnace, into which cylinder the ore is introduced in a pulverised state, with a sufficient admixture of carbon to combine with the metallic oxyde while heated and mixed in said cylinder, away from contact with the atmosphere, so as to deprive the ore of a portion of oxygen, that passes off as a vapour combined with carbon, while the carbonic acid drops away from the end of the cylinder into a furnace to be melted."

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *Improved machinery for forming moulds for casting.* (A communication.) Patent dated March 20, 1855. (No. 630.)

In carrying out this invention the sand, being placed in a chamber or piston box, is moved therein by a pattern, and piston plate surrounding the pattern, and the sand is thus caused to protrude from the piston box and enter a half flask, by which means it is, at the parting, more compressed than at the central portion of the half mould, while on the face of the mould it is sufficiently so to insure good castings and preserve an equal thickness of the metal.

Miller, William, of North Leith, Midlothian, Scotland, gentleman. *An improved apparatus for the prevention of smoke and promoting ventilation.* Patent dated March 22, 1855. (No. 631.)

This apparatus consists of a screw, or set of spiral or helical blades, which is made to revolve in the upper part of the chimney or flue, by means of an external vane-wheel acted upon by currents of air outside.

Morrison, John, of Birmingham, Warwick, machinist. *An improvement or improvements in the manufacture of metallic pens.* Patent dated March 22, 1855. (No. 632.)

Claim.—Effecting the straight and cross grindings of metallic pins, by grinding the sheet metal from which the blanks are cut, or the blank, before it is made into pens.

Biden, James, of Gosport, Hants, gentleman. *Improvements in marine steam engines.* Patent dated March 22, 1855. (No. 634.)

This invention consists in feeding the boilers of marine steam engines with fresh water, obtained by the condensation of steam after having been employed in the steam cylinders. It is carried into effect as follows: The inventor leads a pipe or forms a passage leading from the cylinders into the water outside of the ship at one side, and after carrying the pipe or passage round the stem or stern of the ship, he causes the end of it to enter at the other side, and open into a reservoir in the hold or other convenient part of the ship. He forms this reservoir with two compartments, one above the other, and makes the pipe or passage communicate with the lower one. He keeps the upper compartments filled with fresh water, and makes it communicate with the lower compartment by means of a ball-cock, or float valve, and supplies a pipe to the lower compartment, so as to make it communicate with the atmosphere, and thereby allow any uncondensed steam to blow off. As the steam from the cylinders passes through the pipe or through the passage, it becomes condensed, and the fresh water produced by such condensation will flow into the lower compartment of the reservoir from whence it may be pumped as required into the boilers.

Semple, Matthew, of Plymouth, Devon, gentleman. *Improvements in railway breaks.* Patent dated March 22, 1855. (No. 636.)

Claim.—The employment, as a break apparatus for railway trains, of friction bands which clasp bosses or drums attached to the axles or to the wheels of the carriages, and which are tightened or slackened by means of right and left-handed, or other screws, and a system of rods extending the whole or any required portion of the length of the train, or by other similar contrivances.

Mac Naught, William, of Rochdale, Lancaster, engineer. *Certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.* Patent dated March 22, 1855. (No. 637.)

Claim.—The application and use of auxiliary revolving shafts or drums, placed between the ordinary longitudinal driving-drum and the spindles of spinning-machinery, far the purpose of lessening the friction of the driving band or cord upon the wharve of the spindle.

Whyatt, George, of Openshaw, Lancaster, dyer. *Certain improvements in machinery or apparatus for cutting piled goods or fabrics.* Patent dated March 23, 1855. (No. 640.)

This invention consists in causing the bed plate, with its straight edge, to be alternately raised and depressed, in order to present the pile of the cloth closer to the cutting shears, in such places or at such intervals as may be desirable to produce the effect of stripes in the pile or velvet, by cutting the pile shorter in the places so presented.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in hydraulic motive-power engines.* (A communication.) Patent dated March 23, 1855. (No. 642.)

This invention consists in constructing

the lower part of a turbine, where the water enters, in the form of a cast-iron bell or inverted cup, open at the bottom to admit it. This bell or cup is keyed on to the lower end of a vertical driving shaft for transmitting the power of the machine, and is fitted with a number of curled arms of a peculiar transverse section, formed by the intersection of two arcs of a circle.

BEHN, CHARLES FREDERICK, of the Commercial Sale-rooms, London. *Improvements in machinery for making moulds for casting metal.* (A communication.) Patent dated March 23, 1855. (No. 644.)

Claim.—A moveable piston carrying the pattern upwards, along with the sand upon it, in combination with a flask connected with a piston box, into which the sand is forced with the pressure necessary to form the mould.

RANSOME, FREDERICK, of Ipswich. *An improvement in the manufacture of artificial stone.* Patent dated March 23, 1855. (No. 645.)

This improvement consists in applying soluble silicate, obtained by first fusing the compound of silex and alkali for cementing sand and other substances, in the manufacture of artificial stone, which is subjected to the action of fire to complete it.

YOUNG, WILLIAM, of Queen-street, Cheapside, London. *Improvements in stoves or fire-places.* Patent dated March 23, 1855. (No. 646.)

Within a fixed frame of bars the inventor places another frame which is divided into compartments, and this second frame is capable of being turned on its axis within the fixed frame. The fresh fuel is introduced into the upper compartment of the inner frame, which is then turned partly round, so that the fresh fuel is carried down and comes below the other ignited fuel.

WILLIS, JAMES, of Cheapside, London. *Improvements in certain parts of the frames and furniture of umbrellas and parasols.* Patent dated March 24, 1855. (No. 647.)

This invention consists—1. In forming runners and top notches in which the projecting sharp edges are removed, and a sufficient depth of recess is provided to receive the ends of the stretchers, and prevent them from projecting from the rounded shoulder when the umbrella or parasol is closed, while at the same time the diameter of the runners and top notches is reduced. 2. In forming certain shoulders on the ribs and stretchers. 3. In affixing glass points to the ribs.

JESTY, ROBERT JOSEPH, of the Great Northern Railway, King's-cross, Middlesex, station master. *Improvements in apparatus for indicating between parts of a train of carriages on a railway.* Patent dated March 24, 1855. (No. 650.)

These improvements consist in the application of a weight to a cord, chain, or other means of communication passed over pulleys, which weight shall be allowed range to take up the slack of the cord, or other means of communication, and let out the same as may be needed, without effecting an indication.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SHAW, THOMAS GEORGE, of Old Broad-street, London, merchant. *Improvements in apparatus to facilitate the "tilting" of casks, barrels, or other similar vessels of capacity.* Application dated March 17, 1855. (No. 603.)

These improvements consist in the application of a moveable bed or cradle to frames of wood or metal, such as common "stillages" employed for the support of casks, barrels, or other similar vessels; the elevation or depression of this moveable bed or cradle being caused or regulated by an eccentric or cam placed upon a shaft which extends from side to side at one end of the framing.

BRITTEN, BASHLEY, of Anerley, Surrey, gentleman. *Improvements in projectiles* Application dated March 19, 1855. (No. 604.)

This invention consists in certain methods of disposing the materials of which shot are formed, and of fitting to them expansive rings, which take into the grooves of rifled ordnance.

COOK, BENJAMIN, of Chester-street, Kennington, Surrey, furnace builder. *Improvements in machinery or apparatus for consuming smoke.* Application dated March 19, 1855. (No. 605.)

The inventor proposes to affix to the front or opening of the furnace a framing having two or more doors. The lower of these will be the usual door opening, used for feeding the furnace, and the other will be used for the admission of rarified and subdivided air, &c.

RIMELL, JOHN, of Covent-garden, Middlesex, esquire. *A substitute for the turpentine ordinarily employed in mixing paints and colours.* (A communication.) Application dated March 19, 1855. (No. 607.)

"I take," says the inventor, "a quantity of potatoes, and by mashing, bruising, or pressing them, obtain therefrom an extract. I then add to the said extract of potatoes common salt, alum, and litharge. Having well mixed or incorporated together these said ingredients, I next add a sufficient quantity of water to the said mixture so produced, to reduce it to the required state for mixing with the paint or colour."

HOWSON, RICHARD, of Lancaster, engineer. *Improved means of increasing the motive effect of screw-propellers, and of diminishing resistance to motion in vessels propelled.* Application dated March 19, 1855. (No. 609.)

The improved form of screw-propeller which the inventor proposes to adopt is thus described by him:—"If a section of the blade be taken (at any part) at right angles to the axis, the acting line for forward motion will have the following shape; it will first spring from the boss at a tangent to it, and from this will bend backwards, with a continually expanding curve, until it reaches not less than two-thirds of the entire radius; it will then commence to turn in the contrary or forward direction, and will continue to do so with a rapidly contracting curve, until it terminates at right angles, or nearly so, with the radius." For the purpose of diminishing the resistance to motion in vessels, he proposes to construct them of such a form that all the transverse vertical half-sections of the fore body shall be formed by vertical and horizontal lines, both of which shorten as the bow is approached. He also proposes to connect together a number of vessels lengthwise, the stern of each (except the last) being formed concave, so as to receive the bow of the vessel next abaft it.

TAYLOR, JAMES, of Southwark, Surrey, doctor of philosophy. *An improved means of consuming smoke in furnaces and fire-places.* Application dated March 19, 1855. (No. 611.)

"This invention consists in supplying hydrogen and oxygen gases at a high temperature by preference behind the bridge of the furnace, which gases combine with the smoke," &c.

CHARTRAIRE, FELIX ALEXIS, glove manufacturer, of Paris, France. *A new apparatus for fastening gloves, collars, shirts, and other similar articles.* Application dated March 19, 1855. (No. 612.)

The inventor proposes to employ caoutchouc laces in connection with certain hooks and plates.

WHITE, ARCHIBALD, of Great Missenden, Buckingham, conveyancer and land agent. *Swinging beds, which will enable soldiers and others to sleep dry in tents or huts, and occasionally in the open air.* Application dated March 20, 1855. (No. 619.)

Each bed constructed according to this invention, is to be formed of a hammock, supported at each end by a stand formed of three legs, so united at the top by pin joints, to an iron head, that, when in use, the legs can be expanded, or the lower ends set apart, &c.

STEVENSON, THOMAS, of Little Bolton, Lancaster, mechanic. *Improvements in machinery or apparatus for gasing yarns.* Application dated March 20, 1855. (No. 623.)

The inventor proposes to wind the yarns to be gased on two bobbins at the same time, by fixing at the front of the machine an additional lever, supporting the extra bobbin, but which is allowed to act independently of the lever supporting the other bobbin, so that it can be easily thrown in and out of gear, &c.

BELLHOUSE, EDWARD TAYLOR, of the Eagle Foundry, Manchester, Lancaster, engineer, and DAVID LONGSDON, of Grafton-street, Fitzroy-square, Middlesex, civil engineer. *Improvements in the preparation and manufacture of materials for coverings for buildings and other purposes, such coverings being especially applicable to barracks and military storehouses.* Application dated March 20, 1855. (No. 626.)

This invention consists "in the combination of textile fabrics, or felted material, with metal, or cords, or netting of fibrous material, as a means of strengthening such textile fabrics or felted material."

WILLIAMS, HENRY THOMAS, Archway, Guildford-street, and Keppel Mews North, Russell-square, London. *An improved method of making an easel.* Application dated March 20, 1855. (No. 627.)

The improved easel is made of several pieces of mahogany, oak, or beech, put together with thumb-screws and brass fittings, having, when unfolded, three legs, with a cross rail and a sliding rail fixed to it, the sliding rail having a rest for the picture, drawing, &c., and the whole folding into one piece weighing only 3 lbs.

LECOUR, TELL CLAUDE FRANÇOIS, of Paris, France, mechanical engineer. *Improvements in locomotion on canals and rivers.* Application dated March 22, 1855. (No. 633.)

This invention consists in causing the fall of water in canals produced by the difference of level to set in motion a water-wheel and windlass for propelling boats.

SNOWDEN, JAMES, of Dartford, Kent, engineer. *Improvements in furnaces and other fire-places.* Application dated March 22, 1855. (No. 635.)

This invention consists in providing an exit for flame and such products of combustion as may be consumable, at a point between the surface of the fuel and the fire-bars or grating.

CARNELL, CHARLES, of Philadelphia, Pennsylvania. *Certain improvements in the manufacture of bricks.* Application dated March 22, 1855. (No. 638.)

In carrying out this invention the clay is fed into a pug-mill forming part of the machine, and when tempered by rotating radial

knives, it is forced out by sweeps into a rectangular filling box set in front of the discharge orifices of the pug mill. This filling box has openings in the bottom to permit of the clay being pressed out into moulds which are slidden under the box to receive it. The discharge of the clay is effected by the descent of a piston or pressing plate, actuated by reciprocating sliding rods, attached respectively to arms of a rock shaft to which the piston-rods are connected. At the upper end of the pug mill shaft a wheel provided with adjustable lugs is mounted for the purpose of actuating the sliding rods, and at the lower end of the same shaft is a somewhat similar wheel for giving a sliding motion inwards to a rod attached to a transverse bar, which, as it moves inwards, carries the moulds under the filling box.

Russell, John Scott, of Millwall. *Improvements in ship-building.* Application dated March 22, 1855. (No. 639.)

This invention is intended to provide facilities for covering iron vessels with thick iron, after the fashion of the government floating batteries. "For this purpose," says Mr. J. Scott Russell, "in building an iron ship I construct at intervals transverse frames, each frame being an open frame or skeleton of a bulk-head, made with horizontal beams to support the deck or decks, which frames may, when bulk-heads are required in the localities where they are used, be plated and made close. Such frames or skeletons are connected at all parts so as to be capable of standing alone, and of offering great strength to the body of the ship. These transverse frames are connected together by means of angle-iron bars running in a direction fore and aft of the ship. On the outside (from the keel nearly up to the line of floatation) of the frame of a ship thus constructed the plates of iron are to be riveted to each other; then, in place of continuing the plating on the outside, the frame of the ship is constructed in such manner that the plates are riveted to each other and to the inside of the horizontal bars of the framing, so that the horizontal frames are outside of the plating of the ship, and there will thus be formed recesses to receive the large sheets or masses of iron which are introduced into the same and retained there by suitable fastenings, but it is preferred that these masses should not be rigidly fastened to the ship, but have wood or elastic material behind them, and thus each mass or plate may, so to speak, act as an anvil to receive the shock of a ball or shell."

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery for combing wool and other fibrous materials.* Application dated March 28, 1855. (No. 641.)

By these improvements the carriage of Heilman's machine is made to move in a rectilinear direction, each way alternately, with variable intervals between the movements.

Morton, Henry Joseph, of Leeds, York, galvanised iron merchant and contractor. *Improvements in the construction of gas-holders or gasometers.* Application dated March 28, 1855. (No. 643.)

This invention consists in the application of corrugated sheets of iron, zinc, copper, tin, galvanised iron, or other suitable corrugated metal, to the construction of gas-holders or gasometers.

PROVISIONAL PROTECTIONS.

Dated September 27, 1855.

2152. Peter Armand le Comte de Fontainemoreau, of South-street, London. Improvements in forging iron. A communication.

2154. Matthew Atkinson, of Wandsworth, Surrey, engineer, and Benjamin Ridge, of Putney, Surrey, doctor of medicine. Improvements in the construction and setting of steam boilers for economising fuel, and for rendering the same applicable, not only to the generation of steam, but also to ventilation, the distillation of water for ships' use, and the distribution of heat for general purposes.

2156. James Newman, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of railway-wheels.

2158. Josias Nottidge, of the Atlas Chemical Works, Locksfields, Walworth, Surrey. Improvements in the manufacture of manure.

Dated September 28, 1855.

2160. John Hall Brock Thwaits, of Bristol, Somerset, dentist. Improvements in the preservation of teeth and in the manufacture and application of artificial teeth.

2162. John Talbot Pitman, of Gracechurch-street, London. An improved screw wrench. A communication.

2166. Robert Robey and George Lamb Scott, of Lincoln, engineers. Improvements in locomotive and other boilers.

2168. James Good, of Lincoln, machine maker. Improvements in straw-shakers of thrashing machines.

Dated September 29, 1855.

2172. William Bird Herapath, of Bristol, Somerset, doctor of medicine and surgeon. Improvements in the manufacture of surgical instruments.

Dated October 1, 1855.

2176. John Gedge, of Wellington-street South, Middlesex. Improvements in the manufacture of braid. A communication from Claude Aimé Termé, of Saint Chamond, France.

2178. John Gedge, of Wellington-street South, Middlesex. Improvements in the preservation of grain. A communication from Louis Richer, of Solesme, France.

2182. George Wilkinson, of Evan-street, Poplar. Improvements in steering apparatus.

2186. Joseph François Victor Augier, of Rue de Chabrol, Paris, France, gentleman. An improved apparatus for extracting the aroma from plants and flowers.

2188. Thomas Dickens, of Middleton, Lancaster, silk dyer. Improvements applicable to machinery

[redacted]

for doubling and throwing silk and for doubling other fibrous materials.

2190. George Curling Hope, of Hastings, Sussex, designer and publisher. An improved method of producing figures, patterns, or designs upon textile fabrics for the purposes of needle work.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 16th, 1855.*)

1254. Charles Isidore Constant Denant. Improvements in apparatus for roasting coffee and other substances.

1267. Mary Staite. The manufacture of a new black paint.

1275. William Edward Newton. An improved construction of ship's auger. A communication.

1276. Francis Puls. Improvements in electrocoating iron.

1279. John Gedge. Improvements in the distribution of motive power. A communication from Emile Grill, of Beziers, France.

1285. John Tenwick. Improvements in water gauges for steam boilers.

1288. John Gedge. Improvements in the means of preserving grain. A communication from C. J. Delezenne, of Lille, France.

1289. John Gedge. Improvements in the manufacture of flat tiles. A communication from Mr. C. J. B. J. Vaultrin, of France.

1314. Henri Sibille. Improvements in the decortication and preserving of grain and seeds.

1334. John Henry Johnson. Improvements in governors or regulators for prime movers. A communication from François Theophile Moison, of Mouy, France, mechanician.

1350. William Moxon and John Clayton. Certain improvements in looms for weaving carpets or other looped fabrics.

1355. George Arthur Biddell. Improvements in the manufacture of machines for cutting or grinding vegetable and other substances.

1358. Ebenezer Hollis. A new or improved method of securing ramrods to fire-arms.

1414. Elise Cochaud. Improved apparatus to be used in making aerated or gaseous liquids.

1415. Louis Pol. Certain improvements in pianofortes.

1430. Auguste Edouard Loradoux Bellford. Improvements in steam engines for pumping and other purposes, part of which improvements is also applicable to pumps. A communication.

1437. Auguste Edouard Loradoux Bellford. Improvements in pulverizing quartz, mineral, and other hard substances. A communication.

1445. Ignace Joseph Silbermann. New system of manufacturing globes and other printed plane or curve surfaces.

1496. Francis Lycett. An improved glove, together with the means of mauufacturing the same. A communication.

1520. James Beckett and William Seed. Improvements in machinery for spinning cotton and other fibrous substances.

1638. Samuel Stocker. Improvements in water-closets, and in pumps and cocks for supplying water to the same, and for other similar purposes.

1646. Casimir Deschamps and Charles Vilcoq. A free diving boat.

1706. William Allen. A new vehicle for the transport of camp baggage.

1795. John Coope Haddan. Improvements in the manufacture of rifled and other cannon.

1845. John Coope Haddan. Improvements in the manufacture of cannon.

1893. James Orange. Improvements in apparatus for covering yarns or other cores.

1949. Richard Archibald Brooman. Improvements in umbrellas. A communication.

2005. William Southwell. Certain improvements in machinery for grinding or polishing saws and other articles.

2020. William Armand Gilbee. An improved process and apparatus for the purification and clarification of oils. A communication from M. Laffon, of Paris.

2024. Richard Archibald Brooman. An improvement in casting mortars, cannon, and other hollow articles. A communication from John Webster Cochran, of New York.

2030. Henry Hart. Certain improvements in the manufacture and composition of lubricating and burning oils. A communication.

2072. Jules Albert Hartmann. Certain improvements in the preparation and combination of colours for printing stuffs and textile fabrics.

2079. William Frederick Thomas. Improvements in sewing-machines.

2086. William Sangster. An improvement in the manufacture of stays and corsets.

2090. Alfred Ford. Improvements in preparing solutions of caoutchouc, gutta percha, and like gums, for waterproofing and other useful purposes.

2102. Richard Archibald Brooman. Improvements in obtaining raw silk, which are also applicable to fibres worked in a wet state. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

330. Henry Moorhouse.
356. Joseph Robinson.
357. Thomas Barnabas Daft.
358. William H. Smith.
362. William Tatham.
366. Joseph Nash.
370. Robert Pinkney.
382. William Chisholm.
396. James Lochhead and Robert Passenger.
413. Charles Tiot Judkins.
426. George Wilson Lenox and William Roberts.
430. Richard Archibald Brooman.
432. Edwin Haywood.
452. John Carnaby.
464. John Gilbert and Samuel Nye.
489. Peter Armand Lecomte De Fontainemoreau.
557. Robert Mallett.
731. Edward Davy.
873. William Savory.
875. John Henry Johnson.
881. Claude Laurent Victor Mauride.
895. William Prior Sharp and William Weild.
901. Samuel Walsh and John Henry Brierley.

LIST OF SEALED PATENTS.

Sealed October 5, 1855.

880. Hypolite Macé.
1156. Joseph Morgan.
1263. Richard Peyton.
1271. William Henry Graveley.
1474. Christopher Jelinger Symons.
1644. George Conner.
1824. Paul Pretsch.

Sealed October 9, 1855.

783. Auguste Edouard Loradoux Bellford.
789. John Henry Johnson.
797. James Fletcher.
799. Jean Vincent Marie Dopter.

Sealed October 12, 1855.

809. Alfred Thomas Richardson and George Mallinson.
815. Jean Baptiste Bagary and Claude Perron
823. George Turner.
892. William Hadfield.
900. William Charles Theodore Schaeffer.
926. John Black.
936. Samuel Draper.
1098. William Fawcett, John Lamb, and Francis Best Fawcett.
1268. Peter Augustin Godefroy.
1540. Emile Kopp.
1550. John Coulson.
1604. Adam Burdess.

Sealed October 16, 1855.

836. John Cowley and Daniel Peyton Sullivan.
845. Edward Ellis Allen.
846. Phillip Levy.
873. William Savory.
875. John Henry Johnson.
881. Claude Laurent Victor Maurice.
895. William Prior Sharp and William Weild.
901. Samuel Walsh and John Henry Brierley.

CONTENTS OF THIS NUMBER.

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[redacted]

Mechanics' Magazine.

No. 1681.] SATURDAY, OCTOBER 27, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

GOWLAND'S MARINER'S COMPASSES.

Fig. 1.

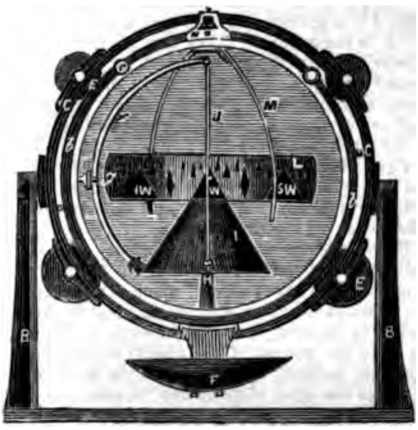


Fig 2.

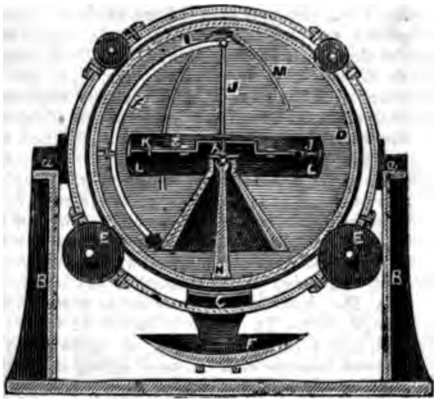


Fig. 3.

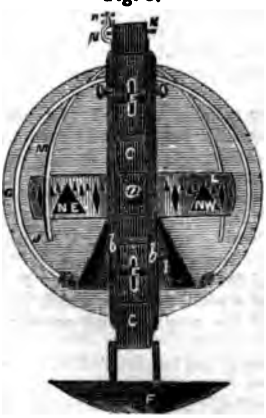
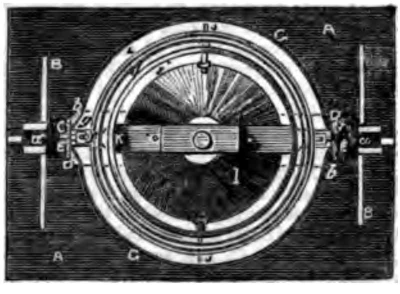


Fig. 4.



GOWLAND'S MARINER'S COMPASSES.

(Patents dated July 15, 1853, and November 29, 1854.)

Mr. G. Gowland, of Liverpool, chronometer and nautical instrument-maker, has patented a new description of mariner's compasses, having cards of a spherical, cylindrical, or other similar form, with the points marked on their peripheries. His first patent is dated July 15, 1853, and the nature of the invention is described on page 87 of our 60th volume, as follows:—"The inventor constructs a compass with the points or graduations marked on the exterior periphery of a zone-shaped card, instead of upon the upper surface of a flat card, and is thereby enabled to raise the compass to a considerable height above the deck of the vessel, and thus to diminish the local attraction of the iron-work of the vessel; at the same time the indications are rendered very distinct, and the steersman is enabled to see both the head of the vessel and the compass with a much less movement of his eye."

Fig. 1 is a front view of one of Mr. Gowland's compasses furnished with certain improvements patented on the 29th of last November; fig. 2 is a section; fig. 3 is a side view; and fig. 4 is a sectional plan of the same compass. A is the base; B, B are two supports or pillars, carrying the pivots, *a*, *a*, of a ring of brass or other non-magnetic metal, C. Within the ring, C, is another ring, D, which is supported and guided by the pulleys or rollers, E, E, which are mounted on the ring, C, and enter a groove in the ring, D. F is a weight attached to the ring, D, which is thus capable of two motions, in planes at right angles to each other, in a similar manner to that obtained by the ordinary gimbals; at the same time the whole face of the instrument is exposed to view, which would not be the case if the ordinary gimbals were employed. G, G are two hemispherical glasses, which are fixed in brass rings, *b*, *b*, attached to the ring, D, by catches or a bayonet joint, and secured by screws, *c*, *c*. H is a stud or pillar attached to the bottom of the ring, D, and having a cup, *d*, at its upper end, which receives a hollow ball, *e*, fixed in the top of a hollow cone, I. This hollow cone is thus free to oscillate in all directions about the centre of the ball, but is prevented from turning round horizontally by means of an arc of wire, *f*, which is attached to it, and which passes through a fork or crutch, *g*, which turns on a swivel or pivot in the ring, D. J is another arc or circle of wire attached to the wire, *f*, and to the cone, I. This wire, J, forms the "lubbers' line," or index to show the course of the vessel; within the ball, *e*, is a cavity containing an agate plate or cup, secured by a small hollow cone, *h*, screwed into the ball. A small spring is placed under the agate plate or cup, to reduce the effect of any sudden shock or blow. K is the magnetic needle, having a central pin which rests upon the agate cup, and is kept in its place by the cone, *h*; the point of the pin of the magnetic needle is in the centre of the ball, *e*, which is also the centre of the ring, D, and in a line with the axis of the pivots, *a*, *a*, so that the motions of all parts of the instrument are concentric, and the effect on the needle of the oscillations of the rings, C and D, and the cone, I, is reduced to a minimum. The needle, K, is bent or arched in the centre, and may consist of a single bar of steel, or of a bar of steel or other metal, having one or two or more short steel magnets attached to each of its branches. A light ring, *i*, is fixed to the needle, and carries two pivots, which support a second ring or gimbal, *j*, which carries two other pivots at right angles to the first, and which support the card, L. This card is of the form of the zone of a sphere, with the points or graduations marked on its exterior; or it may be made cylindrical or slightly conical, if preferred, still having the points or graduations marked on its exterior.

The card may be made of thin sheet copper or other suitable material. In order to increase the magnetic power without increasing the weight of the card and needle, Mr. Gowland sometimes makes the card of thin sheet steel, and magnetises it. In this case it may consist of a complete ring of steel, or of two semicircles, with their similar poles united by copper or other non-magnetic substance, at the points opposed to the extremities of the needle, shown in the engravings. M is an arc of wire, attached to a pin passing through the ring, D, and carrying a disc or milled head, *k*, by turning which the arc, M, may be set at any angle or position. This wire, M, is for taking azimuths and bearings of distant objects, and is not required when the compass is only used for steering purposes. N is an elastic piece of brass attached to the ring, D, and carrying a small roller, *n*, which presses against the ring, C, and serves to steady the motion of the ring, D, and prevent any rattling.

Any oscillation communicated to the base of the instrument has but little effect upon the pillar, H, which is, however, free to deviate from the perpendicular, while the cone, I, still remains stationary. If the cone, I, should receive any motion, this motion may take place without communicating any motion to the needle, K, which may also oscillate without moving the card, L. The needle may also vary its dip without affecting the card. The

mode of suspending the box may be somewhat varied by fixing the outer ring, C, in lieu of suspending it on pivots. The glasses, G, G, are then made of somewhat smaller diameter, and are not fixed to the ring, D, but to a smaller ring, supported by pivots within the ring, D. The ring, D, is weighted as before, and the glass box is also weighted at the bottom.

In lieu of the glass box being made of two hemispheres joined in a vertical plane, it may be made of a single piece of glass, of a cylindrical form, or of the form of a sphere, with the upper or lower part (or both) removed, so as to leave an aperture or apertures large enough to admit the card. The upper aperture is covered by a cap, or plate of glass or metal, which may be screwed to a metal ring cemented to the glass. The lower aperture is closed by a plate or hollow cone. Thus, in the compass shown in figs. 1, 2, 3, and 4, the glass may be cemented to the cone, I, so as to come between the wire, *f*, and the card. The "lubbers' line," J, will also be outside the glass; or it may be a separate wire fixed within the glass, or a line painted or marked on the glass itself; the glass is covered with a plate, as above mentioned. The crutch, *g*, may be mounted on a spring. By releasing the wire, *f*, from the crutch, *g*, the box may be turned round, and the lubbers' line, J, may be used for taking bearings: the wire, M, and milled head, *k*, are not then required. This construction is convenient when it is desired to employ the compass as a liquid compass. For this purpose a funnel or vessel is fixed in the centre of the top of the box, and the whole is filled with spirits of wine, or other suitable liquid, with the exception of a small space in the aforesaid funnel or vessel, to allow for the expansion of the liquid. When employed as a liquid compass, the friction of the pivot, or point which supports the card, may be diminished by attaching a float to the card, so as to relieve the point of a portion of the weight. This float may consist of an annular tube of vulcanized caoutchouc, or of thin sheet copper, or other suitable material. When a steel card is employed in the liquid, it may be protected from oxidation by a thin coat of caoutchouc, or other suitable varnish.

In lieu of making the box which contains the card of glass, as before described, it may be made of brass, or other non-magnetic material, and provided with a glass or window on the side next to the steersman. The card may be made cylindrical, or of the form of a frustum of a cone, or other similar form, having the points marked on the periphery, in lieu of making it of the form of a zone of a sphere, as shown in the engravings. In all cases the points are marked on the periphery, so that they may be visible when the card is placed on a level with the eye of the observer, in lieu of being marked on a flat surface or disc, as in the ordinary compass cards. These compasses may be protected by being inclosed in a binnacle or box with glass sides, and made of a spherical, cylindrical, square, or other form, as may be most convenient. At the top of the binnacle, or in any other convenient position, is placed a course indicator, which consists of a card of similar form to the compass cards before described, and having the points marked on its periphery. A fixed wire or index is placed in front of this card, and the card is turned by hand, so as to bring the required point opposite to the index. This indicator is inclosed in a glass case, and may be set by the captain or other officer; and the case may be locked up, so that it cannot be altered by any other person, although it is visible to the steersman, and shows him the course which he is to steer. Instead of a card of the form described, a strip of calico, or cloth, or paper, with the points marked upon it, and placed in a vertical plane, may be employed, being wound upon two rollers, by turning which the required point may be brought opposite to the index.

WAITHMAN'S MACHINERY FOR MANUFACTURING LINT, ETC.

(Patent dated May 26, 1855.)

Messrs. R. W. Waithman, of Bentham-house, York, and J. Waithman, of Manchester, have patented a number of improvements in machinery for manufacturing lint, which promise to be of great service at the present time, when that material is in such unusual request. They consist, *first*, in a method of giving elasticity to the bed or beds which press against the knives, by means of adjustable springs, or levers and weights, so as to produce a uniform or even action between them. *Second*. In methods of causing the linting, scraping, or abrasing effect of the knives or other apparatus upon the material linted to cease at the required point or points during the revolution of the rotary knives upon their axes, so as to prevent the scraping action from being continued after the linted or raised surface is produced. This is accomplished in one case by imparting separately to the knives or other abrasing instruments suitable motions by means of cams, tappets, eccentrics, cranks, levers, or other suitable contrivances. In another case the bed is formed in such a manner that the operation of the knives or other apparatus shall terminate at the extreme point of an acute angle, around which the material is carried. A revolving bed with the surface indented,

corrugated, or broken at any required intervals, is also sometimes employed. *Third.* In a manner of attaching a whetstone or rotary grindstone to the machine, so that when the knives or scrapers require sharpening it may be speedily carried across the machine, thus saving much time. *Fourth.* In the adaptation of two or more beds to a machine in such manner that two or more pieces of material may be worked simultaneously around the same rotating knives. *Fifth.* In the adaptation to a lint machine, where the knife falls upon the bed or cushion, of two or more knives instead of one, these knives being placed parallel to each other, and the cutting edges placed at such distances that the fall of the front knife will take up the cut or scrape of the second knife, and so on. *Sixth.* In taking the required width of sliver of a carded material and placing it upon a piece of cloth, which is rolled upon a roller, and in then introducing the roller into a machine which gives it a to-and-fro motion, thus thoroughly pressing it together.

Figs. 1 and 2 of the accompanying engravings represent elevations of rotary lint machines with one of the outer frames removed, in which the knives are placed around the rotating cylinder, and have given to them a vibratory or up-and-down motion, by which the act of abrasing or cutting is caused suddenly to cease. Fig. 3 is an elevation of a rotary

Fig. 1. Fig. 2.

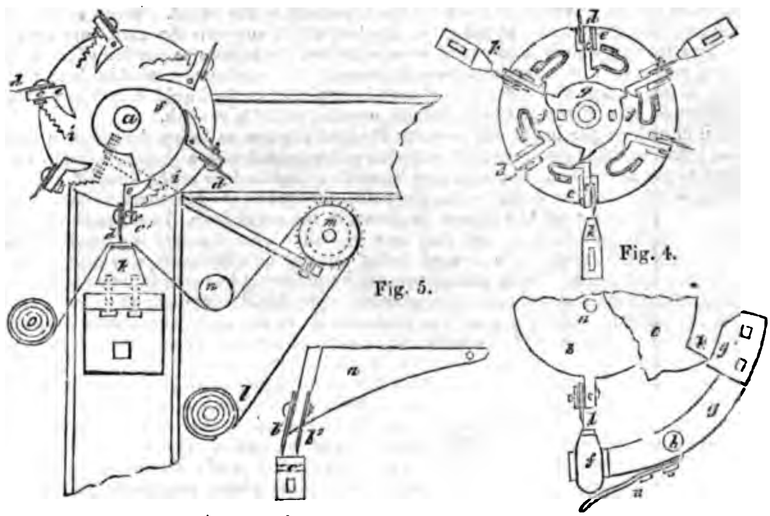


Fig. 4.

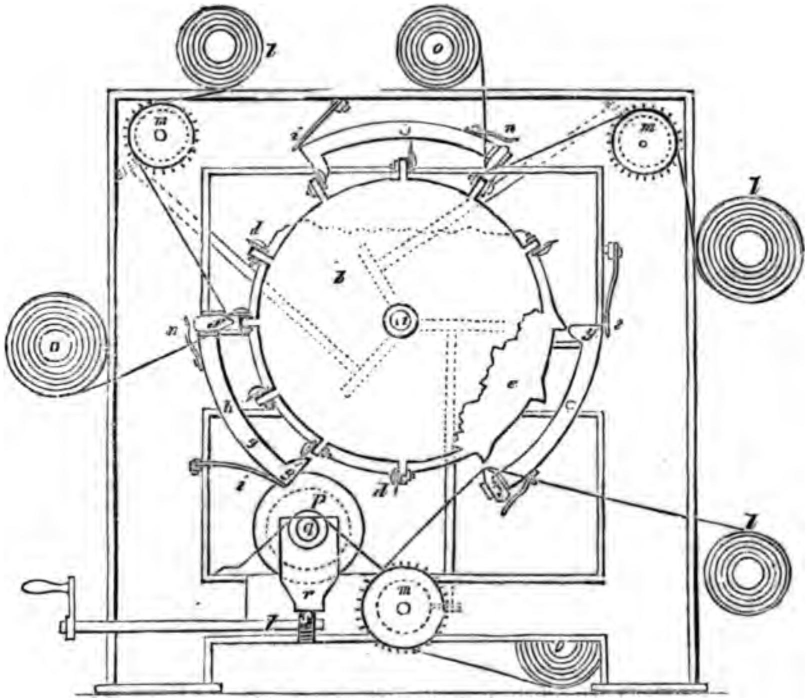
Fig. 5.

lint machine with one of the outer frames removed, in which a vibrating or up-and-down motion is given to the beds or cushions over which the cloth passes, by which the act of abrasing or cutting is caused suddenly to cease. Fig. 4 represents, on an enlarged scale, part of the machine shown at fig. 3. Fig. 5 exhibits the cushion or bed and knife frame of a machine, where the knife falls upon a cushion or bed, and shows the application of two knives instead of one. The following description is from the specification of the patentees:—"In fig. 1, *a*, is the driving shaft of the machine, attached to which is a cylinder, *b*, having connected to it a series of frames, *c*, having affixed thereto the knives, *d*, which with the frames can be of any desired length. The frames, *c*, vibrate upon a pivot or centre, *e*, placed at each end of the cylinder, *b*. There are two cams or tappets, one of which is shown at *f*, which tappets are fixed to the main framing of the machine, causing by the rotation of the cylinder the frames, *c*, and knives, *d*, to move on their centres, *e*, to the position of the frame marked c^1, the return position as seen at c^2 being caused by the spring, *i*. The cushion or bed is shown at *k*, over which passes the cloth to be linted; *l* shows the coil of cloths to be linted, which passes over the pin roller, *m*, the speed of which is adjusted by wheels. From thence the cloth passes under the guide roller, *n*, over the bed, *k*, to the lap roller, *o*. When the machine is in motion the cloth is regularly given off at the required speed, and the cylinder, *b*, in its revolution causes the knives to cut or abrase the same. Immediately upon the removal of the frame, *c*, from the pressing action of the point of the tappet, *f*, the spring, *i*, draws both frames and knife backwards, thus preventing the knives

[redacted]

from removing in their rotation the lint already formed upon the surface of the cloth. Fig. 2 is a modification of the same, showing a mode of giving to the knives and frames an up-and-down motion additional to the rotary motion of the cylinder to which they are attached. In the plan we show simply the cylinder and its knives, with the cushions or beds, the other parts being the same as in fig. 1. *a* is the driving shaft, attached to which is a cylinder, *b*, to which are connected a series of frames, *c*, having fixed thereto knives, *d*, which with their frames can be of any desired length. The frames, *c*, slide between the guides, *e e*, placed

Fig. 3.



at the ends of the cylinder, being pressed inwards by the spring, *f*. There are two cams or tappets, one of which is shown at *g*, which tappets are fixed to the main frame of the machine, causing by the rotation of the cylinder, *b*, in connection with the spring, *f*, an up-and-down or to-and-fro motion to the knives, *d*. The cushions or beds are shown at *k*, over which the cloth passes to be linted. The determinate up-and-down or to-and-fro motion of the knives prevents them from removing, by the rotation of the cylinder, the lint already formed upon the surface of the cloth. Fig. 3 is a section of a rotary linting machine, in which the knives are fixed to the cylinder, and the beds or cushions against which they act have given to them a vibratory motion. *a* is the driving shaft of the machine, attached to which is a cylinder, *b*, shown broken for the convenience of showing the tappet wheel behind, affixed to which is a series of frames, *c*, having knives, *d*, secured thereto, which with the frames can be of any desired length. Also, affixed to the shaft, *a*, is a tappet wheel, *e*. The beds or cushions are shown at *f*, connected to levers, *g*, vibrating upon their centres, *h*. This vibratory motion being caused by the combined action of the projection, *k*, the tappet wheel, *e*, and springs, *i*, upon the point marked g^1 of the lever, *g*, each bed or cushion is supplied with cloth to be linted in a similar manner to the description given of fig. 1. The lever, *g*, and part of the tappet is shown enlarged at fig. 4. When the machine is in motion, the cloth is regularly given off at the required speed, and the cylinder, *b*, in its revolution, causes the knives, *d*, to cut or abrase the same. Immediately that the point, g^1, of the lever, *g*, is removed from the pressing action of the projection, *k*, of the tappet wheel, *e*, the spring, *i*, forces out the bed, *f*, thus preventing the knives from removing by their

rotation the lint already formed upon the surfaces of the pieces of cloth. The adjustable springs to produce an evenness of the pressure of the beds against the knives are shown at *n*, figs. 3 and 4. The sharpening of the knives is accomplished in a very speedy manner by means of a grindstone, *p*, fig. 3, having a rotary and transverse motion; *q* is a slotted shaft, to which the grindstone is connected by a pin working in the slot; *r* is a guide connected with the grindstone, to the lower end of which the rack, *s*, is attached, having a transverse motion given to it by the handle shaft and wheel, *t*.

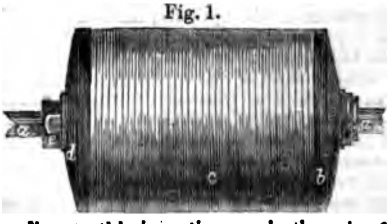
"We may also sometimes use for the purpose of causingthe knife suddenly to cease its cutting or abrasing effect an apparatus similar in its principle to the cams and screws upon the fallers of a flax-drawing frame, or sometimes an apparatus similar in principle to the chain gills and guides of a flax-drawing frame. In fig. 5 the knife frame is shown at *a*, having fixed thereto knives b^1 and b^2, of any desired length, and the bed or cushion upon which they fall at *c*, the other parts of the machine not being required to explain this improvement. The knives, b^1 b^2, are fixed to the frame, *a*, parallel to each other at such distance that the fall of the front knife, b^1, will take up or continue the cut or scrape of the second knife, b^2, and so on."

MITCHELL'S ELASTIC ROLLERS.

(Patent dated March 14, 1855.)

ROLLERS which have elastic surfaces are well known to be used for a variety of purposes, in both the arts and manufactures. In the construction of such rollers, it has been customary to employ coverings of woollen or cotton cloth, or of combed wool; but these are found to be very expensive in consequence of the frequency with which they have to be renewed. To overcome this difficulty several plans have been suggested, but in our judgment none which are equal to a method recently patented by Mr. E. J. Mitchell, of Bradford, and illustrated by the accompanying engravings. It consists in covering the rollers with washers, rings, or pieces of cloth, felt, or other suitable textile fabric, placed so as to present the edges at the outside or periphery of the roller, and submitted to hydraulic or other heavy pressure, so as to make the face of the roller hard and compact. The edges of the cloth being on the outside, it is not soon worn away, and a certain amount of elasticity is obtained, which is necessary for the intended purpose. Fig. 1 is a side view of a roller constructed ac-

Fig. 1.

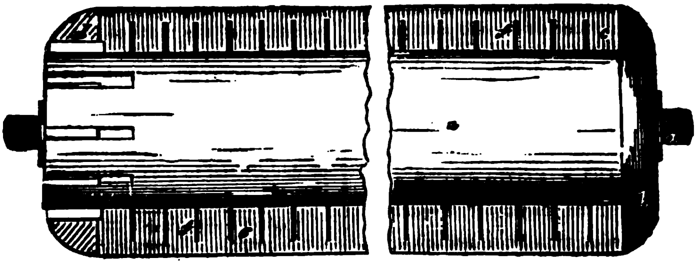


cording to this invention. *a* is the axis of the roller, and *b* is a flange or shoulder, formed at one end of the axis, and of the same diameter as the body of the roller; *c c*, are washers, rings, or segmental pieces of cloth, felt, or other suitable textile material which are placed round the axis, *a*, and submitted to hydraulic or other heavy pressure, to the extent of about three or four hundred tons, in order to consolidate them and produce a compact body for the roller. When segmental pieces of cloth are used, it is desirable that they should be so placed around the axis as to make the radial junction lines of the adjoining pieces break joint with each other; *d* is another flange or shoulder which holds the pieces of cloth on the axis, and is secured in position by a nut, *e*, or by means of keys driven into corresponding grooves in the same manner as a wheel is keyed on to a shaft. The roller being thus formed, is turned down to the required size in a lathe when it presents a hard and compact, but at the same time, slightly elastic surface. Fig. 2 is a longitudinal section of a roller constructed according to Mr. Mitchell's invention, in which the axis is of a large size, as compared with the diameter of the roller. In this case, if the washers, rings, or segmental pieces of cloth, felt, or other material were put on in the manner described in reference to fig. 1, the removal of so large a portion of their centres would render them liable to start or spring away from the axis on the pressure being applied to consolidate them as before mentioned; and thus, although the roller might exhibit no defect when turned down in the lathe, yet as soon as it was in work the side pressure it would have to undergo would produce considerable irregularities in its surface, which would altogether unfit it for its intended use. To obviate this difficulty intermediate metal washers, *f f*, are employed, the diameter of which is sufficiently greater than that of the axis to give support to the cloth, felt, or other material,

without affecting the uniformity of surface of the roller. The number of these washers and their width will vary with the length and diameter of the roller and the size of its axis.

Mr. Mitchell's rollers are rapidly coming

Fig. 2.



into use among dyers, woollen and worsted manufacturers, printers, bleachers, warp-sizers, and others, and particularly in the processes of washing wool and squeezing washed domestic linen, to both of which it is very well adapted, as the roller working in water receives no injury whatever. These rollers also avoid, in a great measure, a very serious evil in cases where it is necessary to gear them with wheels, for if the teeth of the wheels do not correspond with the diameters of the ordinary rollers, a sliding action is produced, which action facilitates the destruction of the covering, and frequently injures the material passing through; while the new roller, when once set or sunk to its place, will remain with little or no change in its diameter. So that all sliding motion is avoided if the wheels are made to correspond. These rollers may be recommended on account of both their utility and economy.

REVIEWS.

How to Detect Adulteration in our Daily Food and Drink. Groombridge and Sons, 5, Paternoster-row.

THERE appears to be no end to the forms in which experienced publishers manage to get sound and useful information cheaply embodied—no limit to the diffusion of knowledge among the masses, unless, indeed, it be their own indifference to it.

This little tract on Adulteration, which forms a portion of a "Sixpenny Library," now issuing by Messrs. Groombridge and Sons, contains thirty-six closely-printed pages of matter, and does really constitute (as it pretends), a complete analysis of the frauds and deceptions practised upon the public by tradesmen and manufacturers in the adulteration of articles of domestic consumption, with full directions for detecting genuine goods from spurious, by simple and inexpensive means. It contains not merely a repetition of what has been previously published by Dr. Hassall and others, but in numerous instances points out cases in which the scrutiny of the authorities failed, and supplements their evidence with several very important facts. Every individual who really objects to being slowly poisoned by shopkeepers, and who has not elaborate works upon the subject of adulteration at his command, should unquestionably possess himself of this little manual.

Mind your Stops! Punctuation made Plain, and Composition Simplified, for Readers, Writers, and Talkers. Groombridge and Sons.

THIS is another of the "Sixpenny Library" manuals; and a very valuable little treatise it is. To many (particularly youthful) minds the matter of punctuation is a great mystery, which neither Lindley Murray, nor Lennie, nor Allan and Cornwall, nor Dr. Latham can dissipate. Nor is this to be wondered at, for it really requires considerable ingenuity on the part of imperfectly-instructed persons to get properly through the mazes of commas, colons, semicolons, periods, hyphens, dashes, long dashes, step dashes, parentheses, and notes of admiration, interrogation, &c. In this little work, however, the whole matter is cleared up, so that a child may understand it.

We are inclined to think the author a little too fond of the innovating dash; although in this respect he stops very far short of the length to which Mr. Brenan is desirous of leading us. We are inclined to think that dashes, if very largely employed, detract from the beauty of the printed page of English literature, without always supplying compensating advantages. It is, nevertheless, certain, that the dash is highly useful in punctuation, and, when properly employed, tends greatly to clearness and accuracy.

Courtenay's Dictionary of Abbreviations, Literary, Scientific, Commercial, Ecclesiastical, Military, Naval, Legal, Medical, &c. &c. By EDWARD S. C. COURTENAY, ESQ. Groombridge and Sons.

THIS little dictionary, which is uniform with the above manuals in size and price, contains fifty-three pages of abbreviations, and has evidently been very carefully prepared. There are but few persons by whom it would not be found a serviceable work.

IMPOSSIBLE EQUATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—1. I wish to offer a few observations on the subject of a certain "impossible equation," which is twice alluded to in your September number. This equation does not appear to me to have anything extraordinary or paradoxical about it. It is proved, or supposed to be proved, in the Theory of Equations, that every rational and entire function has at least one root; and from this proposition we proceed to its immediate consequence; viz., that every such function of the nth degree has n roots, and no more; but no similar propositions have ever been laid down with reference to affected equations. We have, therefore, no reason to be surprised that some of these equations, when understood in a certain manner, cannot be satisfied.

2. The symbolical proposition

$$\sqrt{1+x}+\sqrt{1-x}=1 \ldots \; (1).$$

and all others of the same kind, are ambiguous, because of the ambiguity which necessarily attaches to the symbol $\sqrt{}$. We may write our example in either of the following forms, viz.,

$$\left.\begin{aligned} \sqrt{1+x}+\sqrt{1-x}&=1. \\ \sqrt{1+x}-\sqrt{1-x}&=1, \\ -\sqrt{1+x}+\sqrt{1-x}&=1, \\ -\sqrt{1+x}-\sqrt{1-x}&=1. \end{aligned}\right\} \; (2).$$

The symbol $\sqrt{}$ being, in these latter, supposed to be limited to *one* of its meanings, viz., the positive one. This limitation we may make *mentally* in considering these equations, but we cannot cause such mental limitation to affect the deductions from them. From *any one of them* we derive the rational equation,

$$x^2=\tfrac{3}{4} \ldots\ldots\ldots\ldots \; (3).$$

By the process of deduction, it is proved that whatever satisfies any one of (2) must satisfy (3); therefore, if there be any of (2) which are not satisfied by the roots of (3), *y cannot be* satisfied at all; and they are *proved to be* impossible suppositions.

By trial we find that $x=+\frac{\sqrt{3}}{2}$, satisfies the second, and that $x=-\frac{\sqrt{3}}{2}$, satisfies the third. The other two, not being satisfied by either of the roots of (3), are therefore impossible suppositions.

3. As a second example, let the proposed symbolical proposition be

$$\sqrt{x+3}+\sqrt{x+1}=1 \ldots \; (1).$$

This ambiguous statement may, as before, be understood to mean either of the following, viz.,

$$\left.\begin{aligned} \sqrt{x+3}+\sqrt{x+1}&=1, \\ \sqrt{x+3}-\sqrt{x+1}&=1, \\ -\sqrt{x+3}+\sqrt{x+1}&=1, \\ -\sqrt{x+3}-\sqrt{x+1}&=1, \end{aligned}\right\} \; (2).$$

By rationalizing any one of these we arrive at the simple equation

$$x=-\tfrac{3}{4} \ldots\ldots\ldots\ldots \; (3.)$$

which satisfies the second of (2), but none of the others. Therefore all the others are impossible suppositions.

4. If $\pm\sqrt{x+2}\ \pm\sqrt{x+1}=1$, we find $x=-1$, which satisfies

$$\sqrt{x+2}+\sqrt{x+1}=1,$$

and $\sqrt{x+2}-\sqrt{x+1}=1$, but neither of the other two.

5. From these reasonings and examples I think it will appear that in the equation about which "Ergo" and Mr. Wilkinson differ, there is no paradox, no *sleight of hand*, and no theoretical difficulty. Algebra does in this case not only as much as it promises, but something more. It furnishes solutions when there are any; and, in addition, it proves in what cases no solution is possible.

I am, Sir, yours, &c.,

ALEXANDER Q. G. CRAUFURD.

DUNDAS'S MALLEABLE IRON ORDNANCE.

To the Editor of the Mechanics' Magazine.

SIR,—Having observed, in your number of the 13th instant, a few remarks by Mr. Lyon on the novelty, and liability to burst, of Dundas's malleable iron ordnance, I should be inclined to say, with him, that the design cannot be considered new. And if Mr. L. makes a little inquiry, he will also find that the oval or Lancaster rifle was used many years ago. It is about six years since I used it, and thought then it was the only one; but, after making inquiry, I have since learned that it was known upwards of a century ago; and although neither of these ed-

signs were at their origin brought into general use, such things are only too common occurrences at the present day. How often do we hear of good designs failing, either through prejudice or simply on account of imperfect workmanship; and I should have no hesitation in saying that the latter was the case with Mons Meg. In the first place, we may burst any piece by giving it too much to do; although Mons Meg might have burst simply because the hoops may not have been of equal tightness; but now, since we have the aid of the finest machinery for turning, planing, &c., we may expect better results. But if lightness, strength, and cheapness are necessary in the manufacture of such ordnance, it occurs to me that these would be better got at in the following manner, viz.:—Suppose the piece is ready to be built—that is, the longitudinal bars being finished, let us place a hoop of sufficient strength at breech and muzzle; then let the barrel revolve, winding on itself wire of the strongest quality, at a certain heat, if necessary; and the piece will be very speedily and equally hooped, and free from crystalization.

My ideas on this subject may be quite erroneous; but perhaps some of your numerous readers will be kind enough to favour us with a few remarks.

I am, Sir, yours, &c.,

GEO. HUNTER.

Leysmill, Oct. 16th, 1855.

THE PROJECTILE AND ASTRONOMICAL CONTROVERSY.*

ENGLISH PRACTICAL MEN—THEORY OF THE LOCOMOTIVE ENGINE—LAWS OF MOTION.

[*To the Editor of the Mechanics' Magazine.*

SIR,—The bait which I held out to Mr. Hopkins in my last letter has been, as I fully anticipated, greedily swallowed. I have at last succeeded in drawing out Leviathan with a hook; and his unwieldly tumblings are, as Brother Jonathan says, a "caution" to behold.

To speak candidly—I did not expect that Mr. Hopkins would understand my illustration of the railway-train: and the confusion he has fallen into is precisely of the kind which I should have expected, having had a pretty extensive experience of the kind of confusion of ideas which prevails among uneducated or half-educated men in the science of mechanics—among whom, I regret to say, a very large proportion of the men who plume themselves in England as being *practical* is to be found. I regret very much that this should be the case; for there is no possible reason why it should be so. France is far a-head of us in this as in almost every *really practical* improvement. The honoured names of Morin, Poncelet, and others, who have nobly fulfilled their appointed task of enlarging the borders of practical science and bringing theory and practice into complete accord, are amongst the proudest glories to which France may so justly lay claim. And until our engineers are, like the French, made to undergo a good sound scientific training before they are permitted to ex-

* This controversy has now reached a point at which we find it necessary to interpose. We have, for several consecutive weeks, rejected contributions towards it which were deficient in merit: we are now compelled to exclude others which, were the space at our disposal more capacious, should certainly be inserted. We have this week received (in addition to other letters on the same subject) communications from "W.," Mr. Hopkins, "I. M. E.," and J. E. Nelson. Of these we have to select one or more for exclusion. Without at all depreciating the merits of either "I. M. E.'s" or Mr. Nelson's papers, the importance of each of which we fully recognize, we have consigned them to oblivion; firstly, because the subjects of which they treat are, in themselves, less comprehensive than those which "W." discusses; and, secondly, because the championship of the philosophy first defended by "A Mechanic" and Mr. Wilkinson, has been ceded by these gentlemen to "W.," whose contributions have likewise been spoken of with much respect and approbation by several private correspondents, who have themselves refrained from writing solely in consequence of the appearance of his letters.

It is not our intention to offer an opinion hereupon the nature and merits of this controversy. It is sufficient to say that Mr. Evan Hopkins, who is unquestionably esteemed as an authority by a certain class of engineers, has disputed, in our pages, the truth of the Laws of Motion, and, before the British Association, the received theories of astronomers; basing his assertions, in some instances, upon the results of personal observations, for which he professes to have enjoyed peculiar facilities. We have considered it important that his statements and discoveries should be tested; and although in the discussion of them various unrelated topics have been introduced (as is generally the case in open discussions), we are, nevertheless, confident that the able letters of some of our correspondents have tended to present the facts of science to the minds of our readers with more than ordinary clearness. At the same time, we avail ourselves of this opportunity of suggesting that the letters in which one side of the dispute is conducted, would be indubitably improved by the introduction of a few syllogisms, and the exclusion of foreign observations.

We subjoin a brief abstract of the contents of the letters of "I. M. E." and Mr. Nelson. The former remarks, that in his previous paper he "demonstrated to rigidity that the results of all calculations made from the second tables" (of Mr. Hopkins) "will differ, not only in degree, but in principle, from the measurements given in the first tables; for from these it will appear that the angular measure of the sun's diameter, as altered by refraction, is always less than the true angular measure; and by those it is pretended they are always greater." "I. M. E." then calls upon Mr. Hopkins to give up either his own tables, or "the rules of arithmetic." He concludes by expressing his opinion that "it is perfectly ridiculous for Mr. Hopkins to show a soreness because his theory is probed too deeply," and professing to see no reason why he should "feel tenderness for any man's false theories, when it is so easy to turn them inside out," &c.

Mr. J. E. Nelson, after stating that it is not unnatural that Mr. Hopkins, with his views respect-

ercise their profession, it will be hopeless to expect any reconciliation between the so-called practical and scientific part of our community. There is no royal road to the acquisition of sound philosophical conceptions of mechanical science: this will ever require, as now, much patient and laborious thought and reflection. No mistake can be greater than the vain imagination that the construction of steam-engines, or railroads, or retaining walls, or bridges, will of itself make a man one whit better acquainted with the true principles of the science with which these are connected than if his calling never brought him into contact with these things at all. He will, of course, attain some practical acquaintance with the rules of art with which science has presented him. But this is a very different thing from having a scientific knowledge of the principles on which those rules are founded.

It is most devoutly to be hoped that our country will do something soon to remove the stigma under which she most deservedly lies, of discouraging rather than encouraging the cultivation of science, and of almost making it a merit in the *practical* men whom she delights to honour, that they are wholly unacquainted with the true principles on which the rules of their *art* rest.

To return from this digression to the main business of this letter. I rejoice that Mr. Hopkins, by swallowing so greedily the bait I held out to him, has given me an opportunity, of which I intend to avail myself, of endeavouring in clear and intelligible language to remove some difficulties which I find prevalent among practical men with regard to the nature and relation of forces, and their several effects which are submitted to calculation. These difficulties are in my opinion greatly enhanced instead of being removed by a class of works on mechanics which have lately come into extensive circulation, and which tend, I most conscientiously believe, hopelessly to confuse the notions of those who are so unfortunate as to depend entirely on them for their instruction. Some of these books, which always set up a claim to be pre-eminently *practical*, such as Hann and Gener's Work on the Steam Engine, have been subjected to a severe but not unjust criticism in your valuable pages.

There are *two* distinct aspects under which the relations of forces as regards a moving body may be viewed, but though *distinct* they are not *independent*. The former relation is in fact equivalent to the first equations of motion (expressed in the language of the Differential Calculus), the second is equivalent to the same equations when once integrated. And, as every one who is at all conversant with the principles of mathematical science must be well aware, it is impossible that there should be any contradiction between these. The relations of forces to each other may then be considered—1st, As they exist at any instant of time, independently of all idea of the duration of time through which they have acted, or the space through which they have been exerted; 2ndly, Taking these latter elements also into consideration.

There is no idea of time necessarily involved in the primary conception of a force, nor is this idea contained in the measure of force. In fact, it is plain that when a body is at rest under the action of certain forces, there can be no relation at all between the forces and the time.

All forces are measured by the number of pounds weight which they would support; and it is evident that the idea of weight and time have no necessary connection. For instance, the *friction* of a railway train is estimated as so many pounds (usually 8lbs.) for every ton weight of the train; the re-

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ing internal retarding forces, should think that an inherent tendency to come to rest should enter into the elements of the cases mentioned in his letter, dated October 15, adds, "but, to convince others of this, he must show that the explanations which have been hitherto given of the experiments are insufficient." Mr. Nelson then adds, "for the benefit of those who are *merely* practical men, I may remark, that a considerable experience in connection with the construction of engines, and especially in connection with some of the earliest attempts to apply to those of other descriptions the results to which De Pambour had arrived from consideration of the action of locomotives, has fully proved to myself that his formulæ (by which the motions are explained *in accordance with the received laws of motion*) can contain no hidden error." After speaking of Mr. Hopkins's views as a revival of the old system of vortices, Mr. Nelson concludes as follows:

"That there is some resisting medium in space, appears probable from the retardation of comets, the transmission of light, and, to my mind—although perhaps not to the minds of others, from the existence of such a force as gravity; but, from its slight effect on comets, even when retrograde, it must be far more rare than their substance, which is shown to be almost inconceivably rarer than anything known on earth. In such a substance, the heavy planets could not float, like balloons, in strata of the same, nor, like seaweed, upon strata of greater density than themselves. What, then, could retain them in their places?

"Were this difficulty got over, it would follow that there must be a series of vortices, one within another, moving with immense, but different forces and speeds. What should prevent these currents disturbing one another, like those of the air and ocean, or their becoming gradually expanded and lost, as the latter show a tendency to be, when not confined by shores, mountains, &c.?

"And supposing this, too, accounted for, how could it be explained, that retrograde comets contend against currents so powerful, that the paths of the asteroids cross one another at fixed points—that comets do not show by a zig-zag course their passage from one vortex to another—that their perturbations correspond to their positions, not with regard to the *planetary orbits*, but with regard to the *planets themselves?*

"When *all* these questions are *satisfactorily* answered, it may be worth while to consider whether *the vertical theory* can be made the basis of an *improved system of astronomy*."—Ed. M. M.

sistance of the air at so many pounds for a given velocity of the train; when it is known for one velocity, it can easily be estimated for every other.

The effect of the steam power employed in the engine is to produce a thrust in the direction of the motion, which, in accordance with the principles of mechanics, may be transferred to the circumference of the driving-wheel. (We need only consider one driving-wheel, for whatever be the number, the thrust may be considered as distributed equally amongst them.) This thrust must also be estimated in lbs. Now, it is evident, that at *every moment* of this motion there must be some relation between these several forces quite independently of the space through which they have acted.

There will also be a second relation connecting the horse-power of the engine with the work done by the several resistances.

It was the *former* of these alone that I gave in my last letter: to the *latter* of these alone the remarks of Mr. Hopkins can be supposed to apply.

Accordingly, I repeat the statement I made in my last letter; and adjoin to it a second respecting the latter relation.

Firstly. *When a railway train is moving uniformly (whatever be the velocity), the effective thrust of the engine applied at the circumference of the driving-wheel, is equal to the friction of the train, together with the resistance of the atmosphere to the train's motion.*

Hence these three forces are in equilibrio, and may be supposed to be removed: in other words, the train is moving under the action of *no force.*

Secondly. *The effective horse-power of the engine is equal to the work done by friction, and by the resistance of the atmosphere, in a minute of time.*

Although Mr. Hopkins has so great a horror of algebraical symbols; yet, being an engineer, he *must* (however repugnant to his feelings it be) apply algebraical formulæ in the exercise of his profession, unless he delights in the ancient rule of thumb methods. I shall, therefore, express these relations in symbolical language, as I shall be able thereby to show that these two relations are *necessarily* connected together.

Let P' be the mean effective pressure of steam on the piston.

V' mean velocity of the piston, that is, the number of feet it describes per minute.

Then $P'V'$ = effective horse power of the engine.

Let P = effective pressure at the circumference of driving-wheel.

a = the radius of wheel.

n = number of revolutions it makes in a minute; and

$\pi = 3{\cdot}14159$, the ratio of circumference of a circle to its diameter.

Also let V = velocity of train.

Then $V = 2\pi na$ = space through which the force acts.

V or $2\pi na$ is also the space through which the friction and the atmospheric resistance act.

Let F = friction of the train in lbs.

And H = resistance of the atmosphere in lbs. when the velocity is 1 foot in a minute.

HV^2 = resistance at velocity V.

The two relations I have above stated give rise to the two equations.

$$P = F + HV^2 \quad . \quad . \quad . \quad (1)$$

$$P'V' = FV + HV^3 \quad . \quad . \quad . \quad (2)$$

Now the effective horse power of the engine must be equal to the work done by the power P at the circumference of the driving-wheel;

$$\text{or} \quad P'V' = PV \quad . \quad . \quad . \quad (3)$$

$$\text{Hence} \quad PV = FV + HV^3 \quad (4)$$

which (dividing by V) becomes equation (1).

Your readers will now readily comprehend that I am far from denying that, to make a given train proceed at a high velocity, requires a greater supply of steam than to drive it at a low velocity. For to satisfy the equations (3) and (4), which exactly express the physical circumstances of the case: if P become only slightly increased (the increase being due only to *atmospheric* resistance, in accordance with the laws of friction), and $P'V'$ the horse power of the engine be considerably increased, we must have a corresponding increase in the amount of V or the velocity of the train, which is in strict accordance with fact.

When, then, Mr. Hopkins imputes to me "the grave error of supposing that a train could move at an uniform velocity without consuming steam power in the ratio of the velocity," the error consists in his own confused notions of the subject, and not at all in my statement, which is strictly true. Mr. Hopkins will also see that his lecture is entirely thrown away, although I am glad to see that, unlike his "*alter ego,*" "Civil Engineer," (perhaps in consequence of the instruction I gave him in my last letter,) he does know how to measure "work."

But, with the single exception that he seems to know that a higher velocity demands a greater consumption of steam, I cannot conceive anything more unsound than Mr. Hopkins's notions of the duties of steam power in a locomotive. It is a great blessing that an engineer may build very good engines, and may manage them very well too, and yet know nothing of the philosophy of the instrument he directs.

Mr. Hopkins only exposes the dense obscurity in which his notions are enshrouded

when he asks so triumphantly, "Is not 'W.' aware that a train going at any given uniform velocity requires a certain amount of steam constantly to keep it going at that rate, *in addition to that* required to overcome the resistance of the atmosphere and the friction?"

Now, what, as a matter of fact, takes place when an increase of steam is supplied by the boiler? The engine immediately makes an effort to adapt itself to the conditions which nature has imperatively imposed upon it. It must consume the steam; but the *mean pressure upon the piston* cannot be materially increased, as I have shown. To satisfy both these conditions, therefore, the cylinder fills and empties itself at a *more rapid rate;* and the train, consequently, goes faster. But, at the same time, the whole of the effective horse power is employed in overcoming the resistances; for, as the train moves quicker, the friction and the atmospheric resistance both act through a greater space, and greater in just such a proportion that the work developed by them is just equal to the horse power of the engine. In fact, not a tittle of the steam power is consumed in *directly* maintaining the increased velocity.

I trust that I have succeeded in giving an intelligible account of the physical circumstances, to which a train driven by a locomotive has to conform, which may not, perhaps, be entirely devoid of interest to some of your readers.

It is very amusing to see how Mr. Hopkins, when he has by accident stumbled on the true principle, is so unconscious of it that he loses no time in dismissing it again as quickly as he can. In describing the experiments made by Lardner and others with a locomotive on an inclined plane, he says, very truly, that the reason the train was found to go after a time at an uniform speed was, the propelling gravitating power was exactly balanced at a certain velocity by the friction of the wheels and the resistance of the air. For the incline substitute the level railway, and for the gravitating power the power exerted by the engine; and this is exactly what I have maintained. But this Mr. Hopkins will not or cannot see. No doubt when the train reaches the *level railway*, after being allowed to descend the incline by its own weight, its motion would gradually decrease, and be ultimately destroyed; for it is then subject to the *sum* of two *unbalanced* pressures; viz., friction and atmospheric resistance, which, by virtue of the first and second laws of motion, must ultimately reduce it to rest. I shall now take leave of Mr. Hopkins, declining to follow him into the mass of confusion which fills up the remainder of his letter.

When I first saw his most instructive postscript, I had serious doubts whether it were worth while to take any further notice of his so-called theories. The determination of the paths of bodies from *given* elements has been an employment of many years of my life; the difficulty I have is in determining the path of a body from elements which are *not given*, as in Mr. Hopkins's so-called diagram and explanations. We now know what, in Mr. Hopkins's opinion, is the value of algebraical symbols and formulæ. I had certainly an idea that the new theory was to do for gunners what the received theory cannot; viz., supply them with data from which every problem in projectiles could be readily and accurately solved. But how this can be done by simply furnishing them with an undetermined law, I cannot imagine.

Has Mr. Hopkins yet suggested to the authorities at Woolwich the valuable experiment of "throwing up a ball?" If not, I advise him to do so without delay, and see with what gratitude they will receive his suggestion. Perhaps he is ready to conduct the hazardous and difficult experiment for them.

I must now take a final leave of this grand discoverer until he condescends to reply to real and valid objections taken in all good faith, with something more than the miserable twaddle contained in the postscript of his letter in No. 1680. It is very refreshing to turn from such a production as I have just been discussing to that signed "O. P. V.," evidently written by a controversialist of very different calibre. I cannot, indeed, quite agree with that gentleman's observations, although I think I can understand the point of view from which he looks upon the question at issue. Entertaining a deep respect for him, I shall endeavour to treat him with all respect. "O. P. V." is doubtless aware that French mechanical philosophers admit only two laws of motion; viz., Newton's first and second laws, and entirely discard the third—that "action and reaction are equal and opposite," on the precise significance of which our own standard writers (although they all give it a meaning in complete accordance with the truths of mechanical philosophy), are by no means agreed. While some give it a meaning very much the same as "O. P. V.," others make it mean little more than the assertion of the equivalence of the two measures of force used in statics and dynamics. For my part, I incline to the French opinion, that only the first two laws are strictly to be considered as laws of motion. The third it seems more proper to look upon as a great mechanical principle, harmonizing admirably with the two laws properly so called, but still not necessary for the reduction of the motion of

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a body, under all circumstances, to calculation, as the first two laws are.

"O. P.V." considers the first law as simply tantamount to the definition of the term *force*. To this I cannot subscribe. In the language of mechanical philosophy, any cause which alters, or tends to alter, a body's state of rest or motion, is called force.

Suppose, as was generally believed, in the Pre-Galilæan period, there were an innate tendency in every body when put in motion to slacken its own velocity; this would be owing to the actions of an *internal* force, but no less truly a force than if it were external to the body; and this is, indeed, what was anciently meant by the *vis inertiæ*, or force of inertia. But how, in that case, would the first law apply? The forces contemplated in Newton's first law are, in fact, *external* forces. In the best works on the subject the first law is formally stated with regard to *external* forces. "A body in motion under the action of no external force will continue to move uniformly in a straight line." This is tantamount to declaring that there is no *vis inertiæ*, no *internal* retarding force resident in a body. And it is just this that has formed the subject of the present controversy.

Many inconveniences would arise, in my opinion, from the substitution of the principle of equality of action and reaction for the first law of motion. Although "O.P.V."s statement of the cause of the diminution of the horizontal component of the velocity of a projectile is correct; and I entirely subscribe to it; yet difficulties would arise in applying the same principle to the diminution of the vertical component which is due to two causes—the resistance of the air and the attraction of the earth. Now, although there is a mutual action between the earth and the projectile body, the effect on the earth's motion is absolutely inappreciable, and it would be impossible either to explain the nature of the motion of the projectile on the principle of reaction, or to submit it to calculation. It is very true that the *vis viva* lost by the projectile in consequence of the mutual action of the projectile and the air is gained by the air. But there is also in ascending a much more considerable loss of *vis viva* due to the action of gravity.

In cases of this kind, where the action is continuous, and not impulsive, we can only calculate the interchange of action and reaction by the *vis viva* gained and lost; and I think "O. P. V." will agree with me that a conception of this kind is much more difficult than a conception of a gain or loss of velocity due to the direct action of a force.

In fact, a notion of *vis viva* can hardly be acquired at all until the student has become familiar with the relation that holds between the velocity of a body falling freely from rest, under the action of gravity, and the space described by it: and this requires a knowledge of the ordinary method of treating forces in accordance with the *two* laws of motion.

I think that, upon further reflection, "O. P. V." will see that it is the *first law of motion*, understood of *external* forces, which lies at the foundation of the solution of all problems of motion, and which is the real question at issue at present between the new and old schools.

I am, Sir, yours, &c. W.

OPTICAL ILLUSIONS OF THE ATMOSPHERIC LENS.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Hopkins vents a good deal of indignation on the impertinence of "I.M.E." and myself for presuming to comment on his paper on this subject before fully comprehending it. One of the main objections I bring against it is its unintelligibility, and the inaccurate use (to say the least of it) of technical terms, which renders his meaning obscure. It appears, now, that by *two opposite horizons* we are to understand two opposite points of the horizon; *i. e.*, two points 180° distant from each other. Mr. Hopkins would have saved himself and us much trouble, and himself the expression of a good deal of indignation had he condescended to use terms in accordance with the established conventions. As the horizon is generally understood to be the great circle in the heavens, 90° distant from the zenith of the observer, I really was to be pitied, not blamed, for not understanding how two opposite horizons could exist.

"I. M. E." is very roughly dealt with, and will, no doubt, be able to defend himself; but really Mr. Hopkins is too hard upon him with regard to the measurement of the sun's apparent diameter. I suppose Mr. Hopkins will allow that the sun's *vertical* diameter *may* be measured; and, in that case, as the correction for refraction must be employed, I do not see how we can avoid measuring the altitude of two limbs separately. I must also say, that as far as any meaning can be extracted from Mr. Hopkins's paper, "I. M. E." was warranted in supposing that the vertical diameter of the sun was the object of his observations. A great portion of Mr. Hopkins's letter is quite beside the question, and I must decline following him in his tirade against persons disputing questions with which they are not sufficiently acquainted. He may find some of the observations he adduces not without interest and utility to himself. But I

think it very hard that the whole answer to my very reasonable objections should be contained in remarks which, however interesting in themselves, are scarcely to the point. What I want is an intelligible explanation of the principles on which Mr. Hopkins has made his observations. He will scarcely succeed in gaining himself a niche in the gallery of martyrs to philosophy, until he has taken common pains to condescend to the level of every-day philosophers in the explanation of the wonders of science of which he is the supposed discoverer.

I have certainly never been in the region within the tropics; but I am yet to learn that this incapacitates me from forming a judgment on the mode in which experiments in that region have been conducted. We have only Mr. Hopkins's word for his so-called discoveries, and these are at variance with facts most carefully and accurately observed both in those regions and elsewhere: the least we have a right to demand is an intelligible account of his proceedings.

Mr. Hopkins tells me that if I refer back to his paper I shall find that his "apparent diameters of the sun are in accordance with the observations made on the sun's apparent diameter *from Greenwich* from June to December," and not different.

If the two sets of observations are the same, then what is it which Mr. Hopkins wishes to establish in opposition to the Greenwich astronomers? But according to his own statement here, *this accordance* is only to be found from June to December. In half the year, from December to June, the observations are allowed to be very different.

I certainly understood that Mr. Hopkins had undertaken to prove that the supposed variations of the sun's apparent diameter were no variations at all, but optical illusions of the atmospheric lens. In that case if the apparent diameter depended only on the altitude, it ought to be the same at whatever period of the year it be observed so long as the sun's altitude is the same. Of course, the sun's altitude goes through considerable variations every day, both summer and winter; and this is an experiment which every one may make for himself without going to the equator. It is apparently an *assumption* of Mr. Hopkins that the sun's diameter is observed at Greenwich on any particular day only at the *highest* altitude.

But under any circumstances, this paragraph of his letter is no answer whatever to this remark, to which it is intended to apply, even according to his own showing.

It would be very satisfactory if Mr. *Hopkins would* produce some of his host of *naval* and other captains who corroborate his notions—especially those of the former class, as we should then have some authority from which we could, perhaps, obtain something intelligible which is all I am at present "presumptuous" enough to ask for.

Mr. Hopkins has really a most ingenious way of inverting (if I may use the term) the words of his antagonists. Of his candour and fair-dealing I will leave every one to judge who will take the trouble to read my remarks on the supposed discredit which has fallen on some of Newton's theories with Mr. Hopkins's very *ingenious* assertion that, "I confess and acknowledge the *various* so-called mathematical theories which have fallen into disrepute, referred to by Civil Engineer."

All that I acknowledge is, that Newton did not at once perfect that glorious system of philosophical induction from observation which he so happily commenced. Had he done this, he would have been rather a God than a man. We all confess that science is not to be perfected in any age by any man, however searching his penetration and acute his intellect. With an opponent who possesses so small an amount of candour and shame, or who has so little acumen as to make so gross a mis-statement, it is impossible to *argue*. In fact, from beginning to end, Mr. Hopkins has taken pains to show that argument is entirely out of his line. I shall therefore be content to allow matters to rest as they are, being satisfied as to the verdict which every reader of your valuable magazine who is capable of forming a judgment will give on the merits of the issue which has been raised between us.

I shall take leave of Mr. Hopkins with the remark that it is no *argument* to impute to those who differ from him, "a preference of the imaginary to the reality." It is the vain conceit of these gentlemen who want to turn the philosophical world upside down, that they alone are entitled to the credit of observing the world as it is, that lies at the bottom of all the futile attempts they are making to substitute the unintelligible for the intelligible—the irrational and inconsistent for the rational and consistent. But until they are better prepared to maintain their own theories, I would strongly advise them not to render themselves ridiculous by bringing them before the public. I repeat it—all that I have asked is a rational and intelligible account of these theories; for doing which I am called a "presumptuous schoolboy," and come in for other choice bits of abuse, written in imitation of Mr. Bumble, who vented his ire on poor Oliver Twist, who had the "presumption" to ask for more. I am, Sir, yours, &c.

London, October 22, 1855. W.

SUN'S APPARENT DIAMETER.—PLANETARY ORBITS.

To the Editor of the Mechanics' Magazine.

SIR,—Allow me to make a short reply to each of your correspondents on these subjects. I would recommend "W." to pay more attention to *observations and facts* than to hypothetical systems, and I beg to remind him that the former should be obtained irrespective of any systems, instead of being patched and coaxed to suit the latter, as has been too much the case. "W." states that "The apparent diameter is the *true* angle subtended by the sun's real diameter at the earth's centre," and that "What is directly observed, therefore, is not the true *apparent* diameter of the sun, but that angle subject to the usual *astronomical corrections*." I have to give the same hint to "W." as he has done to "I. M. E.," viz., "the inconvenience of departing from the received definition of the *apparent diameter* of the sun, which he does in his observations." When we take direct observations of the sun, the *immediate* result is the *apparent* diameter; and when we deduct the amount of augmentation produced by the obliquity of the atmospheric lens, the resulting diameter would be that observed when the sun is not affected by refraction, or seen in the zenith, viz., 30′ 36″. This diameter remains invariable throughout the year when observed in the zenith. As there is as much difficulty in descending to "the centre of the earth" as there is in ascending to the unknown region of empty space, I must insist on your correspondents confining their arguments within the region of observation and experimental proofs, and not extending them to the regions of imagination.

The *mean* diameter of the sun adopted in the "Nautical Almanacs" from 1833 to 1852 was founded on Bessel's observations, viz., 32′ 0″ 18. Since then a correction has been made by the Astronomer Royal, founded on observations made at Greenwich, and not at "the centre of the earth;" the mean diameter is now (as seen at Greenwich) 32′ 3″ 12,* that is, 31′ 30″ 18, in June, and 32′ 36″ 6, in December, which "W." may reduce to the centre of the Radius Vector, if by so doing he can throw any additional light on the subject. The visible, the apparent, and the observed are synonymous terms, and different to the calculated and mean conditions; the latter are determined by the former. Astronomers, with a view of establishing a convenient and uniform measure of time, have recourse to *mean* solar day—mean velocities—mean diameters, so as to avoid all the errors arising from atmospheric illusions, &c.; thus they reduce all their observations to *the true Copernican system*, that is, perfect circles, and uniform velocities, which, according to my observations, are the true conditions of the heavenly bodies. As far as the apparent variable diameter of the sun is concerned, the observed diameter is correct at the latitude of Greenwich, but quite the reverse to that obtained by observations in a corresponding latitude south, as stated in my paper; but this difference only affects observations taken in the southern hemisphere, and not astronomical computations.

Your correspondent, "O. P. V.," has very kindly come forward to assist us in deciding some of the questions between us. "O. P. V." states that "the first law of motion is rather a *definition of the word 'force'* than a law or statement of fact." If the word *force* be employed instead of a *body* moving uniformly, we need not waste any more time on the question; because we can, with consistency, assume the existence of acting forces urging bodies at any given rate, but not that inert matter could move without the aid of force. Your correspondent, "O. P. V.," states that, so far as he understands the controversy, it is, in point of fact, the third law of motion—action and reaction, which has been called in question. *I* have not called this law into question; on the contrary, I employ it to maintain my argument. If a material particle* propelled by a force be made capable of continuing for ever in a straight line, moving over equal spaces in equal times, it cannot stop or change its course, unless such *force* be taken away or opposed by an equal and opposite *force*. Two equal forces acting upon such a particle at right angles would not destroy each other, but form a compound motion: the diagonal of the parallelogram would represent the new direction of the magnitude of the combined forces. If one were taken away, the particle would continue to move at the rate and in the direction first assigned to it, as the diagonal resultant of any given parallelogram depends on the continuity of the original condition of the respective forces. Again, if two such *forces* act in direct opposition upon a partiele, they would remain stationary in a state of equilibrium, like equal weights in a scale; but they would not destroy each other: on the contrary, the moment one *force* is removed, the particle proceeds; whereas the supporters of the first law of motion, *without a force*, maintain that a body will go on for ever, describing equal spaces

* The cause of this apparent increase is explained in my work on Geology and Magnetism.

* I speak of a particle merely as a means of rendering the effects of forces apparent.

in equal times; and yet, if you stop that body but one moment, and leave it stationary, it remains without action. If your correspondent, "O. P. V.," will explain this apparent paradox, I shall feel much obliged to him.

I shall now reply to Mr. Nelson's remarks. I beg leave to inform this gentleman, that I have not assigned a new figure to the orbit, but have shown and proved, by direct observations, that Kepler was not justified in distorting the symmetry and the uniformity of the movements of the solar system, as laid down by Copernicus.

My instruments were sextants, repeating circles, and theodolites manufactured by the best English makers, Messrs. Troughton, Gilbert, Wilkins, Dollond, Cary, &c., and far superior to those employed by Kepler. I do not understand what your correspondent means by "*the angular magnitude by the naked eye;*" perhaps he will explain it in his next letter. My observations are not different from those made at Greenwich; on the contrary, those I have made in England correspond to the sun's apparent diameter, as measured at Greenwich; neither do they disturb the calculations founded on the *mean* observations, &c. What I maintain is this, that the sun's apparent diameter is *the same*, viz., 30′ 36″, throughout the year when seen *in the zenith;* and therefore that the orbit must be a circle, as first laid down by Copernicus. The music of the spheres, and the numerical order of the planets, and various other fanciful notions propounded by Kepler, have long since disappeared; yet the Copernican system remains unchanged in its original beauty and simplicity, and so it will continue, whatever may be the fate of Kepler's first law of motion. I shall feel obliged to your correspondent, Mr. Nelson, if he will show us the *necessary connection* between "conic sections" and circular movements. How has "the eccentricity of the earth's orbit been measured, independently of the sun's apparent diameter?" The calculations for eclipses, &c., are founded on the uniformity of the Copernican system, and not on the eccentricity of the orbits. To conclude, Mr. Nelson has neither added any strength to the arguments of my opponents, nor in any way brought forward a single question which affects the result of my observations. My reply to "W." will be sufficient to meet the other points alluded to in your correspondent's letter.

I am, Sir, yours, &c.,

EVAN HOPKINS.

38, Thurloe-square, Brompton,
Oct. 22.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

ELDER, DAVID, junior, of Glasgow, Lanark, engineer. *Improvements in moulding or shaping metals.* Patent dated March 24, 1855. (No. 651.)

This invention mainly consists in a mode of making moulds, for casting metal articles, of parallel section throughout, or nearly throughout their length, in which moulds a pattern piece of short length is connected to a sliding frame, constructed to contain driving mechanism for giving a reciprocating motion to a rammer encompassing and sliding upon the pattern piece, the whole being arranged so that the reaction of the rammer shall raise the frame and pattern piece as each increment of the mould attains the degree of consistency and hardness for which the mould is set.

CLEWE, T. E. F., of Paris, France. *A new construction of locomotive engines, tenders, and railway carriages.* Patent dated March 24, 1855. (No. 653.)

In carrying out this invention the wheels have each a separate and distinct movement of their own provided for, and a peculiar arrangement of caoutchouc or other elastic springs is used in lieu of the present metal or steel bearing springs of the rolling stock.

LEWIS, GRIFFITH GEORGE, C.B., major-general, Royal Engineers, of Woolwich, Kent, and JOSEPH GURNEY, of St. James's-street, Middlesex, military tailor. *An improved construction of knapsack, convertible when required into a bed, a litter, or a tent.* Patent dated March 24, 1855. (No. 654.)

This improved knapsack, which is constructed by preference of deodorized India-rubber cloth, consists simply of a sheet of suitable dimensions for lapping round and covering the soldier like a blanket, to which sheet a flexible compartment for containing the soldier's kit is sewn.

BROWN, WILLIAM, of Gresham-street, London warehouseman. *An improved mode of preparing sewing silk for the market.* Patent dated March 24, 1855. (No. 655.)

In carrying out this invention the silk is wound directly from the swifts or bobbins on to reels, by preference stamped out of cardboard, and the ends of the silk are secured in suitable notches formed in the reels for that purpose. Silk thus reeled off is packed in trays so as to permit of its inspection by the intending purchaser without being removed.

BRITTEN, JOHN, of Birmingham, Warwick, engineer. *A new or improved machine for sweeping or cleaning chimneys.* Patent dated March 26, 1855. (No. 661.)

This invention consists—1. In the use of angular brushes formed so as to take into

the corners of flues. 2. In raising the machine up a chimney or flue by means of cords or chains, attached to the main stem of the machine at a point situated above the level of the brushes, during the ascending motion of the machine. 3. In making the main rod capable of turning round itself without turning the angular brushes with it.

BARRETT, GEORGE ALLAM, WILLIAM EXALL, and CHARLES JAMES ANDREWES, of Reading, Berks. *Certain improvements in portable and fixed combined thrashing machines.* Patent dated March 26, 1855. (No. 662.)

This invention consists—1. In working the top and lower riddles of portable and fixed thrashing machines, by means of the straw-shaker crank, thereby dispensing with the riddle crank usually employed for that purpose. 2. In causing two separate blasts or currents of air to proceed from the same blower, at right, or any other angles from each other; the one into the dressing machine usually fixed to the lower riddle of a thrashing machine, the other into a second dressing or finishing machine, attached to the end of an ordinary thrasher. 3. In forming the discharge shoots and the riddles of the second dressing machine in one piece, and giving them a vibratory motion in the longitudinal direction of the thrashing machine. 4. In working the discharge shoots and the riddle of the second dressing machine, by means of a link attached at one end to one of the riddles of the thrasher, and at the other end to the middle of second dressing or finishing machine, &c.

McKINNELL, JOHN, of Glasgow, Lanark, gentleman. *Improvements in ventilation.* Patent dated March 26, 1855. (No. 663.)

Claims.—1. A general arrangement of ventilating apparatus. 2. Ventilating apartments or other enclosed spaces, by means of two concentric tubes or passages opening at their lower ends in the ceiling, and communicating with the external atmosphere at different levels. 3. The application and use in ventilating apparatus in which the inward current of air descends through an annular passage, of an adjustible flange or annular plate, which serves to close the passage either wholly or partially when required, and which, when open, acts as a deflector, and sends the current out in an horizontal direction.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for dressing flax, hemp, and other fibrous materials.* (A communication.) Patent dated March 26, 1855. (No. 664.)

According to one arrangement of this invention, the flax or hemp, having been previously stripped or peeled, is placed between two horizontal gratings, the lower one of which is stationary, whilst the upper one is moveable, being attached to a sliding frame to which a horizontal reciprocating motion is communicated by cranks, and connecting rods, or other suitable mechanical arrangements. The upper grating is made in two parts, so that one may be thrown back when fresh flax is to be supplied.

HILL, HENRY CHARLES, of Parker-street, Kingsland, Middlesex. *Improvements in the manufacture of waterproof flock cloth and other fabrics.* Patent dated March 26, 1855. (No. 667.)

Claims.—1. A described mode of preparing water-proof materials for coating or covering fabrics, from vulcanized, mineralized, metalized, or other cured India-rubber, and more especially from the waste of such cured India-rubber, combined with unprepared India-rubber, or gutta percha. 2. The process of curing and rendering inodorous water-proof fabrics by means of a current, or currents of heated air, or steam, and also certain mechanical arrangements for effecting the same. 3. A method of perfuming or imparting an agreeable odour to water-proof fabrics. 4. The flocking surfaces coated or covered with sulphurized, metalized, mineralized, or other prepared India-rubber or gutta percha, combined with prepared India-rubber or gutta percha, &c.

CROSSLEY, FRANCIS, M. P., of Halifax. *Improvements in the manufacture of mosaic rugs.* Patent dated March 26, 1855. (No. 668.)

This invention consists in using for the backs of such rugs a thick pile carpet, the pile of which is composed of worsted or woollen yarns "by which," says Mr. Crossley, "elasticity is given to the rug, and the solvent India-rubber is not nearly so liable to become stiff in cold weather, because it is imbedded between two compact substances made from sheeps' wool, which, being an animal substance, is, comparatively speaking, a non-conductor of heat and cold."

WILLIAMSON, ALEXANDER WILLIAM, of University College, Gower-street, Middlesex. *Improvements in stoves or fire-places.* Patent dated March 26, 1855. (No. 670.)

This invention consists in placing an additional valve or register at the back of the fire, rather low down, so that when the valve or register over the fire is nearly closed, and the valve or register at the back is open, the draft will be from front to back, and downward through the fire, and this state of things may be varied according as the two valves or registers are more or less open.

MARLAND, JOHN, of Leeds. *Improvements in preparing for and in sizing and warping*

woollen and worsted yarn. Patent dated March 26, 1855. (No. 671.)

The inventor first winds the yarns, side by side, on spools or bobbins (a convenient number being fifty yarns on each), and several of these spools or bobbins are then placed in a frame, and their yarns are conducted through a reed or comb, by which any desired number of yarns are spread out and kept parallel (the reed being, by preference, 2 feet 6 inches in length, and having as many dents therein to the inch as the size of the yarn will take). From this reed or comb the yarns pass partly around a roller and descend into the scouring fluid, then under a second roller, up over a third, into wash water, under a fourth roller, up over a fifth, then again descend into wash water, and under a sixth roller, and finally, ascend and pass over a seventh. The first, third, fifth, and seventh rollers are covered with felt or woollen cloth, and are pressed on by uncovered pressing rollers, &c.

Shaw, John, of Lees, manager, Lewis Harrop, of Oldham, cotton spinner, and James Fielding, of Lees, cotton spinner, all in Lancaster. *Improvements in machinery for spinning and doubling cotton and other fibrous materials.* Patent dated March 26, 1855. (No. 673.)

These improvements apply to that class of spinning and doubling machinery called "self-acting mules," "twining jennies," and other similar machines, wherein self-acting headstocks are employed, and especially to those worked by what are well known as Sharp and Roberts's headstocks, and consist principally in improved arrangements of the working parts of the same.

Bourne, John Cooke, of Holmes-terrace, Kentish-town, Middlesex, artist. *Improvements in photographic apparatus.* Patent dated March 27, 1855. (No. 674.)

This invention consists—1. In constructing photographic apparatus in such manner, that the box or case in which the camera is contained may serve as a foundation on which the camera may be supported when in use, and so that, when out of use, the front part of the camera may be folded into the back part, and be placed in a compartment within the box. 2. In constructing the box or case, so that when opened it may form a base for a tent, which is constituted by means of a lath fixed on a centre or pivot at each angle of the inside of the box, the several laths being raised and united at the top in pairs, so as to form, as it were, two gable ends, in order to support a covering of suitable fabric, within which the operations of preparing the sensitive surface, developing the photographic picture, &c., may be performed. 3. In providing for adjusting the position of the lens of the camera, so as to place it always in the direction of a curve, the radius of which is the focal length of the lens.

COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

Byrne, Charles, of Dublin, fish-dealer. *A preparation of a certain kind of fish combined with pepper, wine, and other condiments, which preparation may be used for sandwiches.* Application dated July 13, 1855. (No. 1567.)

The inventor takes the whole of the fish contained in the shell of a lobster, except the legs, and cuts it small by any suitable machine. The material thus reduced is then put into a vessel heated with spirits of wine, and as much butter added as will keep it from burning; also a small quantity of salt, Cayenne pepper, juice of lemon, and the essence of tomata or love apple. The whole is allowed to simmer for five minutes, and a little lucca oil and sherry added.

Pidding, William, of Putney, Surrey. *Improvements in coverings for the feet of bipeds and quadrupeds.* Application dated July 17, 1855. (No. 1599.)

This invention consists in manufacturing the soles and heels of boots, shoes, &c., or the soles of shoes for quadrupeds, either of gutta percha and caoutchouc, or of the latter alone, and in such manner that hermetically closed cells, containing gases or liquids, are formed therein.

Pidding, William, of Putney, Surrey. *Improvements in the manufacture of building materials.* Application dated July 17, 1855. (No. 1600.)

This invention consists—1. In cementing together pieces of coke, pulverized pumice - stone, stone, porcelain, stoneware, glass, shells, bones, and sand, and earthy or metallic matters, with a cement formed of pulverized silica dissolved in a strong or highly concentrated alkaline solution rendered caustic with lime, and combined with the above materials by powerful pressure. 2. In luting the joints of pipes with gutta percha, caoutchouc, or both. 3. In combining coke, peat, wood, pumice-stone, &c., with papier maché pulp, the compound being pressed and dried.

Tildesley, James, of Willenhall, Stafford, manufacturer. *An improvement or improvements in currycombs.* Application dated July 21, 1855. (No. 1658.)

These improvements consist in making metal handles to currycombs, and in attaching them to the combs in a position better adapted to suit the hand when in use, and so as to be convenient for packing.

Brough, Nehemiah, of Birmingham, Warwick. *Improvements in the manufacture*

of clasps and buckles. Application dated July 31, 1855. (No. 1735.)

This invention consists—1. In manufacturing a safe and simple description of clasps for belts, bands, &c., in which the attachment of the two parts of which it is composed can be quickly and easily effected; and, 2. In making buckles for belts, bands, &c., by stamping or striking them up from sheet metal, instead of employing the round metals or wire now used.

Robert, Joseph, of Liege, Belgium, mechanical engineer. *Improvements in machinery for manufacturing fire-arms.* Application dated August 1, 1855. (No. 1739.)

This invention consists of a combination of mechanical parts and arrangements by which an improved means of cutting, rifling, or grooving the barrels of fire-arms is secured.

Britten, Bashley, of Anerley, Surrey, gentleman. *Improved projectiles.* Application dated August 1, 1855. (No. 1740.)

A full description of this invention was given in our Number for August 11, (No. 1670), page 129, vol. lxiii.

Meyerstein, William, of Friday-street, London. *A new and improved sewing machine.* Application dated August 3, 1855. (No. 1754.)

The improvements accomplished by this machine "consist simply in laying one thread along the bottom of the material which is to be sewn, and in letting the other thread in the needle go down and seize it from stitch to stitch."

Warner, Arthur, of New Broad-street, London, merchant. *Improvements in coating or combining sheet-iron and steel with sheet-lead, zinc, tin, copper, or alloys of such metals.* Application dated August 4, 1855. (No. 1770.)

This invention consists in coating or combining sheet-iron and sheet steel with steel, lead, zinc, tin, copper, or alloys of such metals, by applying soldering metal between them, and subjecting them to heat whilst pressed together in a flat or nearly flat state, the heat being applied through one or both of the metals.

Thomas, Charles Frederick, of Massachusetts, United States of America. *Certain new and useful improvements in boilers for steam-carriages.* Application dated August 8, 1855. (No. 1798.)

This invention mainly consists in combining with an air-receiving mouth (arranged on the front end of the locomotive steam-carriage), a chimney and smoke-box, a secondary chimney, and a concentric or surrounding air passage by which when the carriage is in motion a current of air may be caused to rush into the first chimney, and around and about the mouth of the secondary chimney, so as to increase the draught.

Webster, Alonzo, of Vermont, United States of America. *An improvement in machinery by which a horse may be suddenly disengaged from a carriage, while running away with the same, or whenever required to be detached from it quickly.* (Partly a communication.) Application dated August 9, 1855. (No. 1803.)

This invention mainly consists in attaching to each end of the whiffle a moveable spring clamp, a cast off, a spring latch, &c., for the purpose described in the title.

Pitt, William, and Edward Turner Davies, of Birmingham, Warwick, brass-founders. *Improvements in the manufacture of cornice poles and picture rods, and in rings and chains to be used in connection therewith.* Application dated August 22, 1855. (No. 1902.)

The inventor makes the above articles of zinc, and coats and colours them so that they resemble brass.

Hope, John, and Thomas Hope, of Rhode Island, United States of America. *An improved machine for engraving the surface of a calico printer's roller, preparatory to its being etched.* Application dated August 31, 1855. (No. 1969.)

This invention mainly consists in the combination and arrangement of two sets of measuring markers, certain hold-back rods, and a roller, with a plane surface table, the same being not only to enable the design to be transferred as it is brought forward in regular sections, but to be maintained flatly upon the tables.

Partridge, Joseph, of West Bromwich, Stafford, plumber, and John Kirkman, of the same place, engineer. *Improvements in malt crushers.* Application dated September 12, 1855. (No. 2062.)

This invention consists in the application to malt crushers of certain plates and a revolving brush with its gearing, for regulating the flow of malt to the crushing rollers.

Gray, John, of Princes-street, Dublin, Ireland, medical doctor. *An improved water-closet arrangement.* Application dated September 17, 1855. (No. 2091.)

"This invention is intended to produce a deeper and more perfect trap, and to cause the closet to be discharged by syphonic action in a full volume and with a flush; and to effect these ends I substitute," says the inventor, "for the part of the closet called the trap, through which the contents of the closet are now usually discharged as by an overflow, a pipe of metal, earthenware, or other suitable material, so formed that it constitutes a trap to the closet much deeper than the ordinary trap, and that when pro-

perly supplied with water, either directly through one of its extremities, or through the closet-pan, or through both, its discharging end acts as a syphon, and draws off the contents of the closet, solids and liquids, the syphon discharging the same through its long leg in such force and volume as to flush the soil-pipe and drain into which the contents may be discharged."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Certain improvements in fountain lamps.* (A communication.) Application dated September 17, 1855. (No. 2100.)

This invention consists—1. In constructing the lamp without any opening in the reservoir, except that by which the oil is conveyed to the burner-cup, and in providing means of filling it at the cup. 2. In placing the handle on the same side of the lamp as the burner-cup and burner, if only one cup is used, and mid-way between the cups if two cups are employed, and below the reservoir and cup.

DEAKIN, THOMAS, of Hazelwell-mills, near King's Norton, Worcester, engineer. *New or improved machinery for manufacturing bayonets, matchets, and swords.* Application dated September 26, 1855. (No. 2150.)

This invention consists of an arrangement of mechanical appliances constituting machinery to be employed instead of hand labour, for the purpose of working into shape, from the rough metal, the various parts of the above-named articles.

CLEGG, THOMAS, of Massachusetts, United States. *Certain new and useful improvements in the construction and manufacture of loom harness.* Application dated September 28, 1855. (No. 2164.)

This invention consists mainly in manufacturing "a loom harness metallic eye, made of round wire or wires twisted together, and compressed and flattened in the twist of its wires, and directly at the top and bottom of its warp-thread opening."

BARROWS, THOMAS, of Massachusetts, United States. *A new and useful improvement in the treatment of wool preparatory to its being carded, spun, or woven.* Application dated September 28, 1855. (No. 2165.)

"My invention, discovery or improvement," says the inventor, "has as its principle the use of oleic acid and such mucilage from plants and seeds as is of a kind that retains moisture, does not readily dry, and yet can be mixed uniformly with oils. In forming the mixture I prefer the purified oleic acid, or so called 'elaine,' which is to a small extent soluble in water."

MARTIN, WILLIAM NEUFOILLE, of Newman-street Oxford-street, Middlesex, captain in the army. *Improvements in the construction of folding and portable crates, boxes, baskets, packing-cases and huts.* Application dated September 29, 1855. (No. 2174.)

These improvements consist in so constructing the above-named articles as to render them more compact, and calculated to occupy the least possible space when not in use. Also in making certain descriptions of boxes or packing cases, which are readily convertible into many useful forms of camp or travelling furniture.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BACHELARD, JOHN LOUIS, of Charles-terrace, Old Kent-road, Surrey, gentleman, and HENRY HARVEY, of Denbigh-street, Pimlico, Middlesex, gentleman. *Making an animal manure for all agricultural, horticultural, and floricultural purposes, by reducing the flesh and bones of all or any of the animals of the earth, and fishes of the sea to a pulp, powder, or jelly, with or without the aid of alkali.* Application dated March 24, 1855. (No. 648.)

The title of this invention expresses the main feature of it.

SCOTT, URIAH, of Duke-street, Adelphi, Middlesex, engineer. *Certain improvements in the construction of carriages, and of the various parts of the same.* Application dated March 24, 1855. (No. 649.)

This invention consists in increasing the height of the front axle to bring it nearer to the line of draught, and also to raise the line of draught to a nearer level with the direction of motion than the present method of construction will admit of; and also in "an improved method of intersecting the metal or other portions of the principal bearings with India-rubber or other similar elastic material, to reduce the severity of the concussion, vibration, and noise."

NIVEN, JAMES, of Keir, Perth, gentleman. *Improvements in the manufacture of paper, and in the production of textile materials.* Application dated March 24, 1855. (No. 652.)

This invention consists in the application to the manufacture of paper and textile materials "of the common broom plant, that is to say, the plant which in the botanical classification of Linnæus is termed the *genista scoparium*, or of plants of the broom species, as also the application of the common whin plant and its varieties, botanically known as the *Ulex Europea*, and other plants of the same natural family, *leguminosa*."

EDWARDS, LEWIS FREDERICK, of New Bridge-street, London, gentleman. *An improvement in furnaces.* (A communication.) Application dated March 24, 1855. (No. 656.)

This invention consists in fitting furnaces

with a hanging bridge and an ordinary bridge, both formed of Godstone stone.

DECHANET, JEAN BAPTISTE, iron-manufacturer, and ANTOINE DOMINIQUE SISCO, practical engineer, both of Paris, France. *Improvements in the process of manufacturing metallic tubes and pipes, and in the machines or apparatus used for that purpose.* Application dated March 26, 1855. (No. 657.)

This invention consists in winding or rolling tightly round a mandril sheets of either iron, steel, or compounds of both these or any other suitable metals, as many times as is necessary to produce tubes or pipes of the required size and thickness. The layers of these rolled sheets are made to adhere together by soldering.

NORTH, ROBERT SAM, of Gorton, near Manchester, Lancaster, engineer. *Improvements in the permanent way and sidings of railways.* Application dated March 26, 1855. (No. 658.)

This invention consists—1. In making rails in two or more parts longitudinally. 2. In making that part of the rail on which the wheels run of such a shape as to suit exactly the periphery of the wheels; also, in giving a continuous support under the flange of the rail by means of angular pieces which form a continuous chair.

GEDGE, JOHN, of Wellington-street South, Middlesex. *Improvements in the manufacture of gloves.* (A communication.) Application dated March 26, 1855. (No. 659.)

Instead of the modes of measuring or cutting skins, &c., for gloves at present practised, the patentee proposes "to use scales of figures or signs corresponding with each other, and so unerringly pointing out the size or cut of the glove required, whether such glove be long or short."

GEDGE, JOHN, of Wellington-street South, Middlesex. *Improvements in machinery or apparatus for forming corners or curves.* (A communication.) Application dated March 26, 1855. (No. 660.)

In carrying out this invention, "a fly or fly-wheel gives motion to a framing to which a planing-apparatus is attached: this is composed of four jointers (planes), and is supported between two grooves, so that the same movement shall be always maintained."

BARTLETT, WILLIAM, of Bradford-street, Birmingham, Warwick, manufacturer. *Certain improvements in ventilators.* Application dated March 26, 1855. (No. 665.)

This invention consists in combining certain bevelled glass rims, placed apart, and covered with a glass dome.

BUSSON, CLAUDE ANTOINE, engineer, of Paris, France. *Improvements in feeding-apparatuses applicable to machines for treating textile materials.* Application dated March 26, 1855. (No. 666.)

This invention consists in presenting to one side of the layer or sliver of textile materials to be acted upon, a fixed rigid smooth surface, and to the opposite side of the layer a moveable elastic surface, into which latter the materials may inlay themselves.

BURNHAM, OLIVER R., of New York, United States of America. *Improvements in the construction of projectiles.* Application dated March 26, 1855. (No. 669.)

This invention consists in forming projectiles with expanding rings, and inclined passages through them.

ARMBRUSTER, CARL, of Andermach, Rhenish Prussia, proprietor of mines, and OTTO LAIST, of Pfeddersheim, in the Grand Duchy of Hesse, chemist. *Improvements in the manufacture of sulphate of soda.* Application dated March 26, 1855. (No. 672.)

The inventors combine pyrites, copper, oxide of iron, and muriate of soda, submitting them in an ordinary reverberatory furnace to a high temperature, and continuing the heating as long as muriatic acid vapours are developed. The mixed substances are then removed from the furnace and left to cool; they are then placed in vats, and washed, as in the ordinary process. As the lye which results is saturated with copper, iron cuttings are thrown in to precipitate it.

PROVISIONAL PROTECTIONS.

Dated June 20, 1855.

1411. Giovanni Martenoli de Martinoi, of Valesolis, Tuscany, and Juan Francisco O. De Lara, of Spain. The employment of a new material in the manufacture of paper.

Dated August 18, 1855.

1876. Omer Jean Henry, of Rue de l'Echiquier, Paris, France, gentleman. Improvements in bookbinding.

Dated August 30, 1855.

1963. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of carbonates of ammonia, and in the useful application of such carbonates.

Dated September 1, 1855.

1980. William Smith, of Salisbury-street, Adelphi, Middlesex, civil engineer. An improved smoke-consuming furnace. A communication.

Dated September 11, 1855.

2055. Thomas Heaton, of Blackburn, Lancaster, engineer. Improvements in pumps

Dated October 2, 1855.

2192. Alexander Sands, of Manchester, iron-founder. Improvements in securing rails in railway chairs.

2194. Laurent-Marie-René Péan, of Paris, France. An improved inkstand.

2196. Richard Threlfall, of Preston, Lancaster, gentleman, and William Knowles, of the same place, overlooker. A certain improvement in looms for weaving.

2198. Julian Bernard, of Club Chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture or production of boots

and shoes, or coverings for the feet, and in the machinery or apparatus, and in the materials employed in such manufacture.

2200. François Fortuné Benvenuti, of Paris, France, gentleman. Certain improvements in typography.

2202. George Louis Stott, of St. George's, Gloucester. Improvements in the manufacture of carbonate of soda.

Dated October 3, 1855.

2204. William Ramscar, of Manchester, Lancaster, engineer. Improvements in fire-arms, which improvements are also applicable to cannons and all kinds of field pieces.

2206. William Patterson, millwright and engineer, of Batley, and George Patterson, mechanic, of Sowerby Bridge, York. Improvements in machinery or apparatus for moistening or damping woollen or other textile fabrics for finishing.

2208. John Dickinson, of Old Bailey, London, paper manufacturer. An improvement in the manufacture of paper.

2210. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for separating gold and other metals from their ores. A communication.

Dated October 4, 1855.

2212. Henry Oldham, of Leeds, York, overlooker. An improvement in weaving textile fabrics.

2214. John Lancaster, of Deptford, Kent, horticulturist. An improved water-proof material.

2216. Thomas Henry Ryland, of Birmingham, Warwick, manufacturer. A new or improved manufacture of bracelets, and other dress ornaments, and ornamental dress fastenings.

2218. Caleb Hardy, of Carstairs, Lanark, engine driver. Improvements in effecting communications between the guard and engine-driver, or between the various parts of a railway train.

2220. Edward Meldrum and James Young, of Glasgow, Lanark, merchants. Improvements in the manufacture of certain salts of sodium and potassium.

2222. Henry Over, of Cambridge, cook and confectioner. A novel construction of gauge knife.

Dated October 5, 1855.

2224. Peter Alexander Halkett, of the Windham Club, St. James's, Middlesex. Improvements in the application of motive power to, and in obtaining locomotion for, the cultivation of land.

2226. Jean Daniel Pfeiffer, of Rue Princesse, Paris. Improvements in the construction of knives or cutters.

2228. Richard Henry Hills, of Castle-banks, Lewes, Sussex, saddler and harness-maker. A jointed back-band for gig or brougham harness, affording instant relief to fallen horses, and always inclining to the draught of the traces.

2230. Thomas Dickens, of Middleton, Lancaster, silk dyer. Improvements in machinery or apparatus for spinning, doubling, and throwing silk, and doubling other fibrous materials.

2232. François Charles Lepage, literary man, of Paris, French Empire. A new composition or new compositions of materials, which may be employed as a substitute for wood, leather, bone, metal, and other hard or plastic substances, and the method of manufacturing the same.

Dated October 6, 1855.

2234. Adolph Coutinho, of Oldham, Lancaster. Improvements in the means of obtaining motive power or continuous motion.

2236. James Washington, of Batley, near Dewsbury, York, machinist. Improvements in apparatus for sweeping chimneys or flues.

2238. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in apparatus for consuming smoke, to be applied to lamps and gas-burners. A communication from Jean Baptiste Theodore Andry, of Paris, France, silk merchant.

2240. Herbert William Hart, of Birmingham, Warwick, gun-maker. An improved cannon for gun-boats.

Dated October 8, 1855.

2242. John Hubbard, of Albion-road, Hammersmith, Middlesex. An improved sole for boots and shoes.

2244. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for the transmission and conversion of motive power. A communication from Jules François Louis Etienne Leséneschal, of Paris, France, engraver.

2246. James Harvey Henry, of Glasgow. Improvements in floating-vessels for carrying goods and passengers on the water.

Dated October 9, 1855.

2248. Robert Willan and Daniel Mills, of Blackburn, Lancaster, machine-makers. Improvements in looms. A communication.

2250. Joseph Gilbert Martien, of Newark, New Jersey, United States. Improvements in the manufacture of iron and steel.

2254. James Murdoch, of Staple-inn, Middlesex. Improvements in extracting colouring matter from lichens containing such colouring matter. A communication.

2256. Etienne François Vion, of Paris, France. An improved tea or coffee-pot.

2258. Stephan Goldner, of Wimpole-street, Middlesex. Improvements in apparatus used in cooking and preserving animal and vegetable matters.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2271. Jane Ann Herbert, of Waterden-place, Guildford, Surrey, widow. Improvements in propellers for propelling steam-ships or other vessels, and which are denominated the "Whinfield or conical propeller." A communication from William D. Jones, of Pokeepsie, and Henry Whinfield, of New York, United States. October 11, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 16th, 1855.*)

1328. John David Kind. An improvement or improvements in spindles for locks and latches, and in attaching knobs or handles to the said spindles.

1340. William Beckett Johnson. Improvements in steam boilers and safety-valves.

1353. Joseph Betteley. An improvement in ships' anchors.

1356. Edwin Lodge. Certain improvements in the production of animal and vegetable naphtha, ammonia, and charcoal, and also for the evolution of the carburetted and olefiant gases therefrom.

1364. William Hewitt. Improvements in propelling vessels.

1369. Hippolyte Mathis. Improvements in preserving wood. A communication.

1372. Dumont Pallier. Improvements in the manufacture of soap or saponaceous substances.

1373. William Jones. Improvements in machinery for punching and shearing plates of metal, which improvements are also applicable to stamping and pressing metals and other substances.

1450. John Page. Improvements in moulding or shaping metals.

[redacted]

1458. Moses Poole. An improvement in the manufacture of printing-rollers or cylinders. A communication.
1586. Thomas Sadleir. An improvement in apparatus for heating liquids.
1590. William Henry Tayler. Improvements in hermetically sealing preserve canisters and other vessels by means of a new arranged screw cap and fittings. A communication.
1649. Peter Armand Lecomte de Fontainemoreau. Certain improvements in the construction of voltaic batteries. A communication.
1914. Frederick Scott Archer. Certain improvements in photography.
1963. William Gossage. Improvements in the manufacture of carbonates of ammonia, and in the useful application of such carbonates.
1967. John Gedge. Improvements in kilns, ovens, or furnaces. A communication.
2046. Charles Hewett. Certain improvements in baking-ovens.
2106. Richard Archibald Brooman. Improvements in knitting-machinery. A communication.
2158. Josias Nottidge. Improvements in the manufacture of manure.
2168. James Good. Improvements in straw-shakers of thrashing-machines.
2200. François Fortuné Benvenuti. Certain improvements in typography.
2212. Henry Oldham. An improvement in weaving textile fabrics.
2218. Caleb Hardy. Improvements in effecting communications between the guard and engine-driver, or between the various parts of a railway train.
2220. Edward Meldrum and James Young. Improvements in the manufacture of certain salts of sodium and potassium.
2271. Jane Ann Herbert. Improvements in propellers for propelling steam-ships or other vessels, and which are denominated the "Whinfield or conical propeller." A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

57. John Joseph Macdonnell.
92. Thomas Lawes.
93. Thomas Lawes.
237. Herm Jäger.
392. Joseph Burch.
398. Joseph Burch.
417. Pierre Augustin Puis.
422. George Randfield Lovell and John Mann.
425. William Roberts.
450. George Heyes.
453. Frederick Richards Robinson.
465. Joseph Cundy.
474. William Weild.
477. Henry Charles Gover.
487. Archibald Slate.
507. Felix Lieven Bauwens.
509. Charles Watson.
515. Robert William Mitcheson.
584. George Thomas Selby.
624. Edward Lord.
725. Julien François Belleville.
746. Joseph Cowen and Thomas Richardson.

LIST OF SEALED PATENTS.

Sealed October 19, 1855.

863. Thomas Lees.
864. Edward Howes and Walter Howes.
885. Horatio Allen.
898. William Winter.
902. Alexandre Balan.
904. Joseph Wright and Edward Brimble.
930. Auguste Edouard Loradoux Bellford.
934. Auguste Edouard Loradoux Bellford.
944. Peter Armand Lecomte de Fontainemoreau.
948. Robert Paul Coignet.
960. Frank James Wilson Packman.
974. George Wigzell Knocker.
982. John Scott Lillie.
986. Henry Lee the younger and John Gilbert.
1008. Henri Gustave Adrien Pecoul.
1056. Frederick William Norton.
1392. John Jones.
1612. James Reilly.
1804. Peter Armand Lecomte de Fontainemoreau.

Sealed October 23, 1855.

909. Henry Jeremiah Iliffe and James Newman.
913. James Hunter and George Hunter.
915. Frederic James Utting.
919. Henry Cockcroft.
924. Mark Mason.
925. John Joseph Victory.
929. Auguste Edouard Loradoux Bellford.
931. Auguste Edouard Loradoux Bellford.
938. Edward Frankland.
941. John Silvester.
952. Emile Muller, Joseph Gilardoni, and Xavier Gilardoni.
1004. Alexander Brandon.
1012. Daniel Foxwell.
1064. Joseph Pascall and George Fry.
1394. Charles Antoine Hartmann.
1874. William Sangster.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Sept. 27	3762	W. Javal	Broad-street	Focus Regulator.
Oct. 1	3763	J. B. Haden	Warminster	Crimean Stove.
5	3764	Wright, Underwood, & Burt	Bristol and London	Wrist Supporter.
11	3765	J. Stoker	Old-street	Pack Saddle.
12	3766	W. T. Dalton and Son	Ratcliff	Socket Bush for Blocks.
13	3767	R. Leake and T. Dodd	Wigmore-street	Portmanteaus.
,,	3768	Crichley, Wright, and Co.	Sheffield	Lever Counterpoise.
17	3769	W. Blackford	Camberwell-gate	Carriage Window Frames.
19	3770	Wheeler, Kinder, & Robinson	Leicester	Carriage Bow Spring.
22	3771	A. Stargardter	Mitre-street	Self-adjusting Golosh.
,,	3772	S. Garside	Ashton-under-Lyne	Vice Dies for Tubes.
		PROVISIONAL REGISTRATIONS.		
Oct. 8	700	D. S. Brown	Old Kent-road	Ship's Inclinator.
,,	701	F. Wickstead	Upper St. Martin's-lane	Carriage Spring Brace & Iron.
,,	702	F. Wickstead	Upper St. Martin's-lane	Double Cee Spring.
9	703	W. Blackford	Camberwell-gate	Carriage Window Frame.
10	704	N. Niven	Dublin	Water-tight Joint.
11	705	T. Greaves	Birmingham	Button Fastener.
12	706	H. Blackford	Long Acre	Raising or Lowering Windows
13	707	D. S. Brown	Old Kent-road	Water Gauge.

NOTICES TO CORRESPONDENTS.

We are compelled to postpone the publication of the letters of "J. M.," John Truran, David Mushet, and "Guliel."

George Wells.—We will endeavour to find space for an article on the propeller you mention shortly.

A Mechanic, but no Lawyer, shall be answered by letter, if he will forward us his address.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of* London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1682.] SATURDAY, NOVEMBER 3, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

WEBSTER'S PRESSURE GAUGE FOR STEAM AND WATER.

Fig. 1.

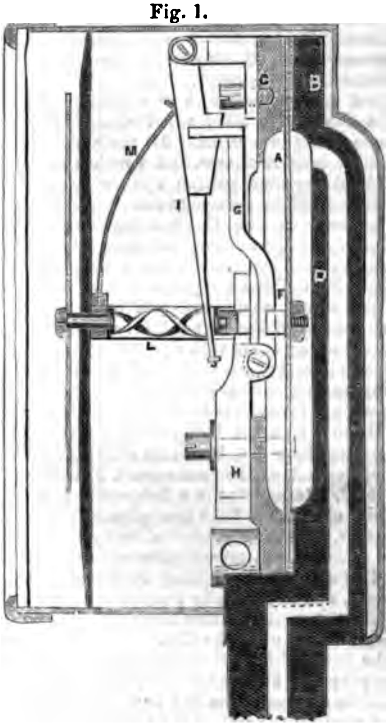


Fig. 2.

Fig. 3.

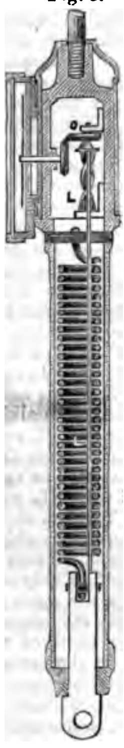


Fig 4.

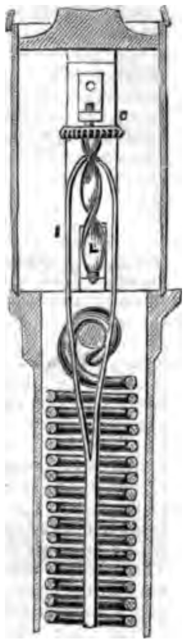


Fig. 5.

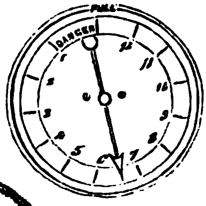
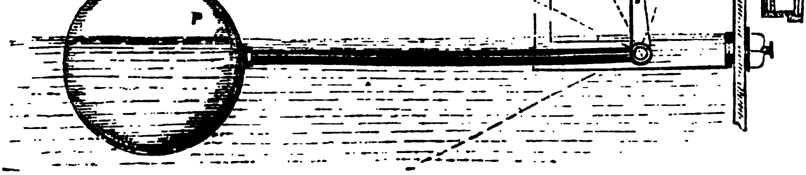


Fig.6.



WEBSTER'S PRESSURE GAUGE FOR STEAM AND WATER.

At the July meeting of the Institution of Mechanical Engineers, Mr. J. E. Clift, of Birmingham, read a paper descriptive of a pressure gauge, invented by Mr. James Webster, of Birmingham, which appears to possess some practical advantages deserving of notice.

The gauge acts upon the principle of a circular elastic plate, receiving the pressure on one side, the plate being fixed round the circumference, and registering the amount of pressure by the extent to which it is displaced or bulged in the centre. The extent of motion of the plate is multiplied by a simple contrivance, and communicated to an index, which shows the amount of pressure by its revolution round a dial. This pressure gauge differs from others acting upon the same principle, mainly in the increase of the area of the plate upon which the pressure acts and in the mode of multiplying the motion, which appears to possess some advantages in simplicity, directness of action, and durability of the parts. The construction of the gauge is shown in fig. 1 of the accompanying engravings, which is a longitudinal section of a pressure gauge for steam or water, extending up to 200 lbs. per square inch, drawn one-half full size. A is the pressure plate, consisting of a circular flat plate of tempered spring steel, No. 18 wire gauge, or about 1-20th inch thickness, and 4 inches clear diameter, or 12½ square inches area, in the central unsupported portion upon which the pressure that has to be measured acts. This plate is fixed in a circular cast-iron frame, B C, by screws round the circumference, which press the outer ring, C, upon the plate, and make a tight joint at the back of the plate by means of a thin washer of vulcanized India-rubber. The back part, B, of the case has a shallow recess, 4 inches diameter, communicating by a channel, D, with the stop-cock at the bottom of the gauge; and this recess becomes filled with water, from condensation of the steam, when employed to measure steam pressure, and always remains full of water on account of the channel, D, entering at the top of the recess, thus preventing the direct contact of the steam with the pressure plate, A. A small steel stud, F, is fixed in the centre of the plate, A, by a screw and nut, and is formed with a knife-edge bearing at the top, pressing against the back of the lever, G; this is centred on a bracket, H, at one end, and presses upon a second lever, I, by a knife-edge bearing at the other end. The sliding bracket, H, on which the lever, G, is centred, is fixed by a screw upon the ring, C, and has an adjustment by a slot, by means of which the length of the short end of the lever from the point of contact of the centre stud, F, can be increased or diminished as may be required. The lever, I, terminates in a fork which works up and down the central spiral, L, upon the extremity of which is fixed the index revolving on the face of the dial. The fork at the end of the lever, I, is shown detached in fig. 2, and is made of two tapered steel rods which enclose the spiral, L, and press lightly against it by their elasticity; the ends of the rods being steadied by a small clip joining them together. The spiral, L, makes one turn only in its whole length, and is gradually tapered and shortened in the pitch towards the outer end, so as to adapt it to the motion of the levers, and give a uniform division for the successive pressures indicated upon the dial.

When the pressure is admitted to act upon the back of the steel plate, A, the plate becomes convex, rising in the centre and pressing by the knife-edge stud, F, upon the lever, G, which multiplies the motion 4 times; and this pressing on the second lever, I, again multiplies the motion 4 times (being 16 times total) at the end of the fork acting on the spiral, L. This fork, in traversing the length of the spiral, 1⅛th inch, turns the index entirely round the dial, in a circle of 16 inches circumference. The total amount that the pressure plate is raised or bulged to produce this motion of 16 inches is 1-16th of 1⅛th inch (the latter being the motion of the forked end of the second lever), amounting to 1-14th inch at the centre of the plate, or ·07 inch. When the pressure is removed, the plate returns to its original position, and becomes again quite flat, and the levers are retained in close contact throughout by the spring, M, pressing on the second lever, I, and bringing the index back to zero.

In this pressure gauge the working parts are all of comparatively large size, having consequently an advantage in strength and durability; they have also great simplicity in construction and action, and appear very free from liability to derangement or accident. The pressure plate, A, consists of a simple flat disc, and this form is considered by the inventor, from the results of his experiments, to have a practical advantage over corrugated plates, which have also been extensively used for the same purpose, on account of the uniformity with which the flat plates can be tempered, whilst the corrugated plates are liable to have an inequality in the tempering, the more exposed portions at the tops of the corrugations being liable to be softer than the intermediate portions. To meet the unavoidable variation in the tempering and resistance of the steel plates, even when plain flat plates are used, the position of the fulcrum of the first lever, G, is shifted by moving the sliding bracket, H, by means of which the range of the instrument can be readily adjusted. Each gauge is sepa-

rately adjusted in this way, by the application of actual pressure, so as to ensure accuracy of the indication in each case. The steel plates are all capable of standing more than double the pressure indicated by the extreme range of the dial, without receiving any permanent set; and it appears from an extensive series of trials made by the inventor, that no perceptible change of elasticity is produced by long exposure to alternations of pressure and continued pressure within the limit. A different thickness of plate is employed for gauges having different ranges of pressure, the area of plate exposed to the pressure being the same in all cases, namely, 12¼ square inches. No. 18 wire gauge, or about 1-20th inch thickness, is employed for pressure gauges extending to 200 lbs. per square inch. No. 20 wire gauge, or about 1-30th inch thickness, for 60 lbs. per square inch. No. 23 wire gauge, or about 1-40th inch thickness, for 20 lbs. per square inch. The extreme deflection of the plate in each case is only about ·07 inch, or little more than 1-16th inch.

A modification of this pressure gauge is shown in figs. 3 and 4, in which a spring is employed to measure the pressure at the end of a safety valve lever, as in an ordinary spring balance, and the indication is multiplied by means of the spiral, L, without the intervention of any lever. The spiral is moved by the forked rod, I, and the motion is communicated to the revolving index by the bevilled pinions, O. A considerably stronger spring than usual is employed in this case, having only 1¼ inch extent of motion, which is multiplied to a circumference of 12 inches upon the dial.

The advantage aimed at in this balance is, that the spring does not require to be extended so much as in the ordinary balance, owing to the introduction of the multiplying spiral, and consequently the steel being less strained, is less liable to a permanent set in the course of long work; also the indications of pressure are rendered more plainly visible by the motion of the index upon the dial.

Another adaptation of the spiral is shown in figs. 5 and 6, where the spiral is applied to the indication of the level of the water in a boiler or a tank. A hollow copper float, P, lies upon the water, the lever of which is attached to a forked lever, I, at right angles to it, which works upon the spiral, L; and as the float sinks with the water, the lever, I, acting upon the spiral, L, causes the index to revolve upon the dial. The forked end of the lever, I, working loosely upon the spiral, and the continual motion of the water in the boiler keeping the float and spiral in constant action, prevent any tendency to stick fast; and the friction is confined to the small conical collar on the spindle of the spiral passing through the side of the boiler, by means of which the joint is kept tight by the internal pressure.

This water gauge has an advantage over the ordinary glass gauge in the indication being always readily seen, as when the water becomes muddy or the glass soiled, the level is not so easily ascertained in the tube; also by enlarging the diameter of the dial, each inch of variation in the level of the water in the boiler can be magnified to 2 inches, or more if desirable.

After the reading of the paper, a specimen of the pressure gauge was exhibited, and put in action by means of a force pump; also specimens showing the construction of the gauges, and the steel plates that had been experimented upon.

The Chairman (J. E. Mc Connell, Esq.) remarked that he had tried the improved spring balance that had been described, and it was certainly more plainly visible in the indications of pressure than the ordinary Salter's spring balance, but he did not see that it was superior in accuracy or durability to the spring; he had had balances of Salter's indicating up to 180 lbs., and they were not found to get set.

Mr. Clift considered Salter's balance was liable to get out of order, owing to the extent to which the spring was stretched, which caused it to be liable to be sometimes strained, and consequently rendered Inaccurate; he thought the small extent of motion in the improved spring balance would prevent the spring from getting set at all.

The Chairman did not think too great an extent of motion was allowed to the spring in Salter's balance, as he had not found any cases of these balances becoming set and thrown out of adjustment, even after being a long time in use; the springs were very excellently tempered, and the least likely to get out of order of any that he had tried.

Mr. Joy observed, that range of indication was not the only requisite in a spring balance, but also range of lift for the valve itself, to give free relief to the steam blowing off; if the range were shortened, there would not be sufficient area of escape for the surplus steam, and the pressure would rise considerably beyond the limit intended to be used. He had known the pressure rise 25 lbs. during blowing off, and in one case where 2½ inches range of spring had been allowed for a limit of 120 lbs. pressure, the increase had been 20 lbs. during the blowing off.

The Chairman asked to what extent the steel plates were tempered.

Mr. Webster replied, that they were first hardened, and then tempered down to just below a straw colour, so that the file would just touch them; the gauge was then adjusted to the

elasticity of the plate, by means of the moveable slot carrying the end of the first multiplying lever. All the plates were proved by a hydraulic press up to double the pressure they were required to register.

Mr. Shipton inquired whether the India-rubber cloth at the back of the plate, being an elastic material, was not found to yield after wear, and affect the fixing and adjustment of the pressure plate; and he asked whether the gauge had been tested by continual exposure to high-pressure steam for a considerable time.

Mr. Webster stated that the India-rubber cloth was used only for the joint at the back of the pressure plate; tin and lead had been tried, but the cloth was found to be preferable, and either a complete disc or an annular ring was employed. The cloth got fully stretched during the testing of the plate, and so did not yield any more afterwards; the thickness in the joint was so small that it could not alter. Each gauge was tried, when made, by subjecting it repeatedly to a pressure double of that at which it was intended to be worked, which would thoroughly bring all the parts to a bearing. He had tried a gauge under a constant water pressure of 150 lbs. per inch for 3 days successively, but did not find any yielding of the India-rubber joint.

The Chairman remarked, that the present pressure gauges were sometimes found to lose their elasticity, and inquired whether this was not the case also with Mr. Webster's.

Mr. Webster answered, that when the plates were made of proper thickness, suitable to the pressure required, and well tempered, they retained their elasticity, and exhibited no tendency to a permanent set after long-continued use. The tempering of the plates required great accuracy and certainty in pressure gauges, and this could be more perfectly accomplished with the thicker plain plates that he employed, than with the thinner corrugated plates, which he had found liable to be rather softer at the tops of the corrugations than at the intermediate portions. The thinner plates were also more liable to set than the thicker ones, and by using the plates of No. 18 wire gauge the tendency to a permanent set was entirely removed.

Mr. Clift remarked, that in Schaeffer's pressure guage, the disc, of about 24 wire gauge, was corrugated in circular corrugations; but in the one described in the paper the disc was flat and about three times the area. The flat disc could be tempered uniformly throughout, and he had been struck with the perfection with which they retained their elasticity in the several severe trials. He mentioned that the pressure gauges were being manufactured by Messrs. Gray and Bailey, of Birmingham.

The Chairman observed, that the uniform temper of the elastic plate was a point of great importance for insuring permanent accuracy, and he thought this advantage and the simplicity of its construction rendered the gauge a very serviceable instrument. He proposed a vote of thanks to Mr. Clift for the paper, and to Mr. Webster for his specimens, which was passed.

MARSDEN'S VENTILATORS FOR MILITARY AND OTHER TENTS.

(Patent dated March 20, 1855.)

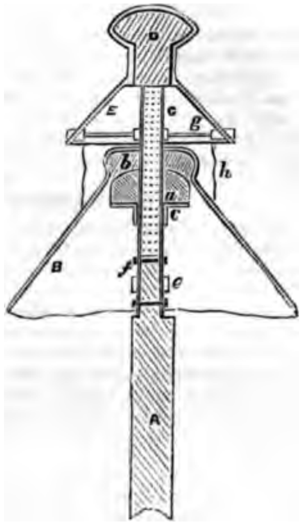
The experience of last winter, during which two besieging armies sustained greater losses from disease than from battle, points to the necessity of adopting improved arrangements for preserving the health of troops in camps. A little reflection will be sufficient to show that one source from which the disease of an encamped army probably springs, is the contaminated atmosphere which must necessarily be respired when a number of men are crowded for hours together in an unventilated or ill-ventilated tent; and facts have clearly shown that this is really the cause from which much of the sickness of our military arises. So foul, indeed, is the atmosphere within a soldier's tent when occupied, that a bird placed in the cone of it, lives but a very few minutes.

The contrivances hitherto adopted for ntilating tents, such as the cutting of cir- ur boles in the tops of them, fitting them with canvas covers to exclude the rain, and the introduction of expansive rings into such holes, have been found very unsuccessful, in consequence of the hindrances which are offered by external atmospheric currents to the escape of undivided currents from the interior.

These facts have induced the persons who have the management of the Army Working Corps to apply a new arrangement of ventilating apparatus to the tents supplied to that corps. In this arrangement a circular hole is cut in the canvas at the top of the tent, somewhat larger than the tent-pole, and the canvas at the edge of this hole is attached to an iron ring which keeps it expanded. Over this hole is slung a canvas cap or cover, which moves loosely up and down the pole, and to which are attached two strings passing over pulleys placed above, by means of which strings the canvas cap is raised or lowered from

within. The cap is kept expanded at its lower part by means of an iron ring, formed in two halves, which are hinged together for convenience in packing. The tent-pole is formed hollow, and is intended to answer, in some cases, the purpose of a chimney, a small stove placed within the tent being connected with it. To this arrangement there are, however, several objections. In the first place it is impossible that rain can be prevented from entering a tent arranged as above described, particularly in windy weather. If the cap is kept raised the rain would enter in large quantities beneath it; and if the cap be lowered, not only would the ventilation be seriously diminished, but a larger surface than usual of the pole would be presented to the rain, which would undoubtedly find its way down into the interior of the tent. In addition to these evils, a very considerable augmentation of the weight of the tent is inseparable from this arrangement; and although this circumstance may be of small importance in the case of the Army Working Corps, it would by no means be so in the case of the bulk of the army. There are other objections incidental to this plan, which we need not here enumerate; they may be readily detected by any one who considers the matter carefully.

An arrangement has, however, been invented which appears to answer every desirable end in a highly satisfactory manner. This plan is the invention of Mr. Marsden, of Gracechurch-street, whose various improved methods of ventilation for boots and shoes, &c., are well known. In this method the inventor forms a portion only of the tent-pole hollow, carrying this portion some distance both below and above the top of the tent. By this arrangement he avoids the necessity of increasing the diameter of the tent-pole, which must be done when the whole length of the pole itself is formed hollow in order to supply the necessary strength. The accompanying engraving represents a section of the upper portion of a tent fitted with his improvements. A is the tent-pole, and B the canvas of the tent, which is secured to the pole by means of the blocks of wood, *a b*, passed over and fitting tightly upon the ventilating tube, C, on the top of the tent-pole. The block, *a*, is fixed to the tube, C, by brackets, *c c*, while the block, *b*, is secured to the top of the tent by means of the cord, *d*, or any other equivalent means. Or instead of the block, *b*, a ring of cord or metal, or other suitable material, may be sewn into and round the hole in the top of the tent. The tube, C, is perforated with a number of holes, and is secured in its place upon the tent-pole by means of the hoops or bands, *e e*, and bolts and nuts, *f f*. Should the upper part of the tent-pole be found too small, in adapting this method of ventilation to existing tents, the tube, C, is fastened by means of wedges, driven in be-



tween the tube, C, and the upper front of the tent-pole. D is a block or plug which is driven into the end of the tube, C; and E is a cap or cover of canvàs, or other suitable material, which is attached to the top of the tent-pole by first passing it over the top of the block, D, and then, if necessary, binding it round with cords or wire. The lower part of this cover is kept distended by four or more rods, *g g*, one end of each of which is let into one of the perforations of the tube, C, the opposite ends of the rods being passed through the cover and secured as shown. This cover is further held in its place by the cords, *h h*, which are either sewn on or tied to the tent. By means of this cover all wet is prevented from entering the perforations in the tube, and through them into the inside of the tent, at the same time the vitiated air has a free escape from the interior of the tent.

By means of the above arrangement, the vitiated atmosphere within the tent enters through the perforations of the ventilating tube, and passes up and out through the perforations above the tent. At the same time it is evident that no rain can enter the upper part of the tent, however stormy the weather may be.

All the advantages which Mr. Marsden's invention offers are obtained without any corresponding drawbacks. A tent fitted with his apparatus may be pitched, struck, and packed with precisely the same facility

as the tents now in use; and the increase of weight is so small, that the use of the apparatus throughout the army would scarcely require the addition of a single horse to the number supplied for every 5,000 men.

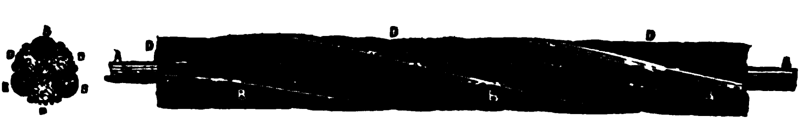
Another feature of the improvement (and one of no small importance) is that the ventilating appendage may be sent to the Crimea or elsewhere, and adapted in about twenty minutes, and at a very small expense, to the tents now in use in the army.

We are much gratified to learn that this highly important invention is likely to be adopted by our military authorities. A tent fitted with it has been standing for some months at the camp at Aldershot, and has, we believe, given entire satisfaction, in every condition of weather, and gained the admiration of many influential army officers. The final report upon it is about to be made to the Horse Guards, and will, we hope, be followed by a rapid adaptation of the improvement to the tents of our army before the cold weather, in which proper ventilation is most required, sets in.

SUBMARINE TELEGRAPH CABLES.

The late failures in the laying of the submarine telegraph cables, in the Gulf of St. Lawrence and the Mediterranean Sea, have not surprised us, knowing, as we do, the principle upon which they are constructed, and their probable insufficiency to maintain the integrity of the copper conducting wires. In the laying of such cables the risks of fracture are greater as the weights, and the depths to which the cables are laid increase. They are formed, as our readers may know, by winding several iron wires spirally round a core composed of the insulated conducting wires and hemp yarn. Now when an increased strain (resulting from an increase in the depth of the water) is exerted upon such a cable, there is danger of the external spiral wires yielding to the tension, and thus collapsing and pressing unduly upon the core; and if this action takes place the copper wires are likely to be completely sundered, while the outer spiral wires remain entire, and the cable is as a whole as strong as ever. The powerful breaks used in the paying out of these cables tend to increase the risks of straining them. This appears to be what has just occurred in the Gulf of St. Lawrence and the Mediterranean, from the effects of rough weather, great depths, and excessive weight—in the last instance, eight tons to the mile. The failure in these cases were brought before the public with more than ordinary prominence by the indiscreet heralding by which the undertakings were preceded; and we advert to the subject lest a general impression that the difficulties to be encountered were insurmountable should be acquired.

In our number for August 13th, 1853 (No. 1566), we published an illustrated description of a submarine rope patented by Mr. T. Allan, in which the crushing and stretching effects above described could not possibly occur. As these ropes are proportionally both lighter and cheaper than the others, weighing, with the conducting wires, only about three tons to a mile, we are surprised that they have not yet been adopted. Such ropes might, of course, be broken under some circumstances, but, unlike the others, they would never be rendered useless until the whole strength of the rope fairly gave way. As the subject is a very important one, we subjoin the following short description, taken from our former article:



"The principle upon which this rope is constructed is that of having an incompressible and intextensible core, by which arrangement all rending or crushing forces are prevented from acting upon the insulated wires, and the security of the rope is made very great. The accompanying engravings represent two ropes constructed on this principle; the first is of the simplest form, A being the core, B the spiral wires, and C the insulated conductors; the second has additional small protecting wires, D, twisted between the larger ones, for the pur-

pose of defending the insulated conductors more effectually against external injury. This principle is the reverse of that on which the Dover and Calais rope is constructed, where the soft insulating medium forms the principal part of the core of the rope; and it is apparent that in this arrangement the conductors are very much more exposed to fracture than in the former."

INDESTRUCTIBLE PRINTING ON METALLIC PLATES.

BY DR. J. LOTSKY.

MESSRS. ADAMS AND GEE, printers, of London, have found that metallic plates, of the thickness of ordinary sheet tin, may be printed upon with the usual printing type, if the plates be first coated with a whitish composition—the secret of the inventors. If sheets thus printed upon be afterwards subjected to a certain japanning process, an even lustrous surface is produced, which cannot be acted upon except by a sharp steel instrument. The cost of preparing the printed sheets is small.*

It requires no great consideration in order to discover that this invention is of a very important character. In the first place, it is evident that printed metallic sheets of the above description may be substituted with great advantage for the mounted paper lessons employed for class teaching in schools, which, from the rapidity with which they become worn, are costly apparatus in all public educational establishments. Moreover, as these durable printed sheets may be prepared very economically, the number of class lessons employed may be greatly increased; and, further, these plates may also be used for maps, diagrams, tables, &c.

In the second place, I venture to suggest that important moral effects might be produced in every country by the circulation of such plates bearing extracts from the highest class of literature, and even well-selected quotations from the Bible itself. I am aware that maxims and precepts printed upon paper are already in extensive circulation; but, from the destructible nature of the fabric on which they are impressed, I believe they do not assume that importance which would be attached to them were they produced upon a lasting material, and in an artistic style. The lessons which might thus be perpetuated, and kept continually before the minds of youths in particular, might well be expected to counteract some of the evil effects of modern worthless and injurious paper literature, which, from its ephemeral character, has a natural tendency to degenerate.

Again, printed metallic plates of the kind under notice will certainly be substituted, and that with great advantage, for out-door notices, advertisements, &c. Much difficulty is at present experienced, and much trouble occasioned, from the fact that information of great interest and importance to the public is inaccessible, in consequence of the want of a method of so publishing such information that the expense of frequent renewal (which in the case of long printed statements would be very great) shall not be incurred. The invention under consideration supplies such a method. Other applications of the invention will suggest themselves to the reader. For my own part, I believe it capable of such applications as, if mentioned here, would probably be considered extravagant.

15, Gower-street North.

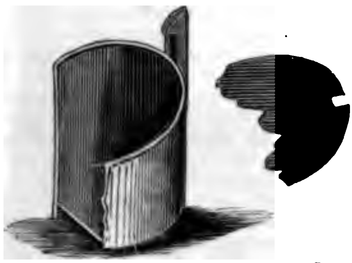
* A specimen may be seen at the office of this *Magazine*.

SCRAPS FROM NORWAY.

To the Editor of the Mechanics' Magazine.

SIR,—Allow me to describe one or two articles as they are used by the Norwegians, and found by long and constant experience to be convenient and cheap. Fig. 1 repre-

Fig. 1.



sents one end of a box made of thin wood, something like a band-box. At each side there is a wooden piece, *a*, with the top bevelled. The lid of the box has a corresponding indenture, *b*, and the natural shape of the box, when full, is such that the lid requires to be pressed to pass the bevelled top, *a*. When this is done, and the indent of the lid sinks into the notch of the piece, *a*, the box will be found most securely closed. These boxes are called, *Spisen Cofers*, that is, "prog baskets."

Fig. 2 is the end of a whip shaft, so

Fig. 2.

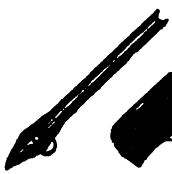


Fig. 3.

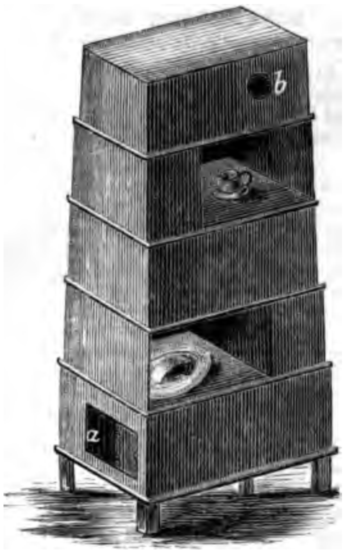
formed as to be also a walking stick. A

sharp prong, like a spear, is fixed at the end of the handle, and a ring, through a hole at *a*, serves to attach the whip lash. By this means a walking stick is combined with a whip which can crack, and otherwise be useful.

Fig. 3 shows an implement used in grubbing up trees, dead roots, &c., and as the Norwegians are more experienced than any people in Europe in this sort of work, it is well to observe the tools they use. *a* is the shaft or handle; *b*, an iron end, like a thick narrow spade, and forming with *c* a strong hatchet or axe, which, when the instrument is used as a spade, serves for the foot to press against.

Fig. 4 is a Norwegian stove, very simple and very comfortable. It will be noticed that the heated air moves upwards in a zig-zag

Fig. 4.



direction from *a*, the fire-end, to *b*, the flue leading to some chimney. In the spaces are shelves for keeping hot cups, bowls, &c. The end opposite *a*, comes off to allow the stove to be swept. The whole is made of slabs of stone. I am, Sir, yours, &c.,

J. M.

Temple, October 31, 1855.

BOYDELL'S TRACTION ENGINE.

To the Editor of the Mechanics' Magazine.

SIR,—"Doctors differ," they say, and so do our civil engineers and farmers. An instance of this latter took place at the late meeting of the Royal Agricultural Society f England at Carlisle, and, unless you can avert the calamity, the mechanical world is liable to be overturned, such is the momentum of forces still. The facts of the case are briefly these:

Some of our civil engineers affirm that the power of the driving pinion on the end of the crank shaft of Boydell's traction engine gearing in the top of the large wheel fixed to the spokes of the carriage-wheel, is not greater than if it had geared in the bottom or any other part of its circumference.

As the statement is not only erroneous, but interferes injuriously with the working of a valuable patent, and as it is also calculated to check the progress of invention and mechanical science in connection with steam culture, I take the liberty of sending you the following four diagrams and remarks, in the hope you will find them correct, and worthy of a place in your columns.

Figs. 1, 2 and 3 have been advanced in proof of the power being greatest when

Fig. 1.

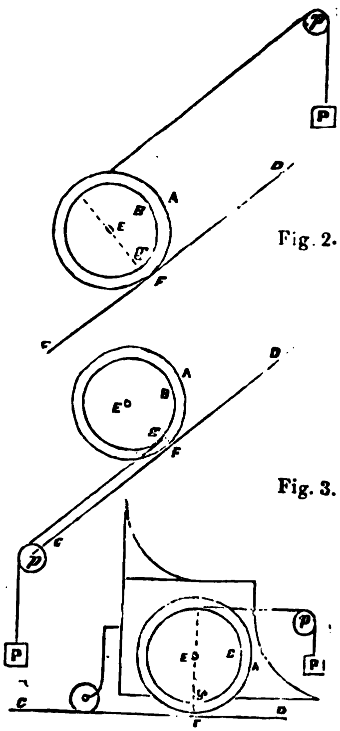


Fig. 2.

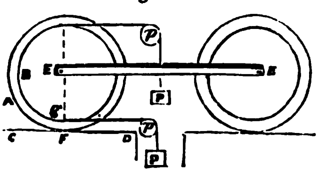
Fig. 3.

applied to the top of the wheel at G, by ourselves, and fig. 4 by one of the civil engineers in question, who exercises a high authority among us, to prove the contrary.

[redacted]

The letters in each case point to similar parts. Let A, be the periphery of a carriage wheel; and B, a drum fixed to the spokes of the same, as in Boydell's case, with a rope round it, passing over the pulley *p*, with a weight, P, attached, and let all the wheels and drums respectively be equal to each other in every respect. Let C D, fig. 1, and C D, fig. 2, be inclined planes, having their angles of inclination equal, and let the powers, P and P, also be equal to each other. Let C D, fig. 3 and C D, fig. 4, be level

Fig. 4.



surfaces, and let the resistance or load be borne on E, the axle of the wheel, in the usual manner, fig. 3, representing a rude sketch of an invalid's chair. Then it is affirmed by our opponents, that the force of traction exerted by P, fig. 1, in rolling the wheel A up the inclined plane from C to D, is equal to that exerted by P, fig. 2, in rolling the wheel, A, up the inclined plane, C D (?); that in fig. 3, the power P, or force of the hand applied to the top of the wheel at G, is equal to what it is when applied to the bottom at *g*, in working forward the invalid's chair; and that in fig. 4, P and P, being equal to each other in weight, are consequently in equilibrium; whereas, we maintain that the contrary is true in each case.

The difference of opinion which has thus taken place obviously arises from a misconception of the fulcrum on the part of our opponents; they supposing it E, the wheel, A, moving in free space, as in the case of the wheel and axle; whereas, the wheel is a rolling body, like a cart wheel, and the fulcrum the point of contact, F, on the inclined plane, C D. In proof of this we have only to observe, that had the wheel been moving in free space, then the radii, G E, and G *g*, would of course be equal; but as the wheel rests upon the point, F, then the example becomes that of a rolling body, and hence the diameter, G $g+g$ F is greater than *g* F. In other words, the power, P, working with the whole length of the lever, G F, is greater than when working with only a part of its length *g* F,—*i. e.*, the whole is greater than a part. If our opponents cannot see this, they have only to get into an invalid's chair, when a brief experiment up hill will convince them of its truth.

I am, Sir, yours, &c. W. B.

London, October 31, 1855.

[In the above letter we have yet another example of the disputes which arise on mechanical subjects, in consequence of a want of either clear conceptions of the laws of mechanics, or of the faculty for expressing and applying those laws with accuracy. We doubt whether our correspondent has truly stated the nature of the dispute in question. Assuming that he has, however, we have no hesitation in saying, that both he and his opponents are in error.

We commend to the consideration of both parties the following observations:—

1. The wheel will, with the arrangement shown in fig. 1, be drawn up the incline, C D, by the weight, P, providing that weight be properly proportioned to the resistance offered to its motion. 2. The wheel will *not*, with the arrangement shown in fig. 2, be drawn up the incline C D, whatever be the magnitude of P; but will inevitably move down it, since the forces which tend to produce motion in that direction are unbalanced. Were the circumference of the drum, B, greater than that of the wheel, A, and both P, and the friction sufficiently great, then the wheel would remain stationary. 3. That the machine shown in fig. 4, will certainly move from left to right, if the forces, P P, are of sufficient magnitude to overcome its friction, since each of those forces (P P) tends to move it in that direction, and is unbalanced. 4. That neither of the arrangements shown are at all analogous to the traction engine of Mr. Boydell; because in each of the former, the pulleys, little *p*, are independent of the machine; whereas, in the latter, the propelling force is applied through a shaft which forms part of the machine itself. This circumstance constitutes an essential difference between the cases.

If we suppose the pulley, *p*, in fig. 3, rigidly connected with the vehicle shown in that figure, that arrangement will become analogous to the traction engine. Let us then assume the pulley, *p*, to be so connected. Let us also consider the vehicle as consisting of two parts—the wheel, and the remaining portions, and observe the horizontal forces acting upon each, supposing the whole to be in uniform motion. *Firstly*, the horizontal forces acting on the wheel are the tension of the cord at G, from left to right; the friction at F, also from left to right; and the thrust at E, from right to left, the latter being evidently equal in amount to the sum of the two former (the friction on the axle being neglected.) *Secondly*, the horizontal forces acting on the remaining portion are the tension of the cord from right to left; the traction, or total resistance (comprising friction and atmospheric resistance), also from right to left,

and the thrust of the axle from left to right, the latter being equal in amount to the sum of the two former. Calling the tension T; the friction at F, F; the thrust at E, R; and the traction T′, we have the following equation:

$$T+F=R. \quad (1).$$

And calling the radius of the wheel, r, and the radius of the drum, r', and taking moments about the axle, E, we have

$$Tr'=Fr. \quad (2).$$

We have also $T+T'=R$. (3).

Eliminating F and R we get

$$T=T'\frac{r}{r'}. \quad (4.)$$

If we now consider the weight, P, to be applied by means of the cord at g, and in the opposite direction, we shall have the following equations (calling the thrust at E in this case R′)

$$F-T=R'. \quad (5).$$
$$Tr'=Fr. \quad (6).$$
$$T'-T=R'. \quad (7).$$

Whence we again obtain

$$T=T'\frac{r}{r'}. \quad (8.)$$

Showing that the relation between the tension of the cord and the traction exerted, is the same in both cases.

This holds, however, only while we disregard the change that takes place in the amount of the friction upon the axle, E. From (3) and (7) we get

$$R=R'+2T. \quad (9).$$

Which shows that the mutual pressure between the axle-box and the axle is greater in the former than in the latter case; and since the friction at this point increases with this pressure, Mr. Boydell's arrangement is, in fact, the worse of the two.

Our object in the above remarks is not so much to preclude the discussion of the subject by our correspondents, as to avoid waste of words upon problems which do not affect the question at issue between "W. B.," Mr. Boydell, &c., and their opponents. We do not give the above investigation as a complete explanation of the whole of the circumstances connected with the motion of the vehicle, since we have purposely omitted to consider many of these in order to simplify the matter. At the same time it includes all that is necessary to lead to a conclusion upon the question proposed by "W. B."—Ed. M. M.]

WINCH HANDLES.

To the Editor of the Mechanics' Magazine.

Sir,—I should be much obliged if your correspondent, Mr. Rook, would be so good as to explain how two men working at a windlass with handles at right angles can raise more than double the amount raised by one man. Your correspondent mentions some experiments made by him, relating to power so applied, and also informs us that Desaguliers' assertion and his experiments give results remarkably similar. I will now endeavour to show that the results are not so exactly similar. The assertion of Desaguliers is, that if one man working at a windlass be able to raise 30 lbs. with a certain degree of ease, then two men will be able to raise 70 lbs. with a greater degree of ease; or, in other words, two men can raise more than double the weight that one can; it being understood that the windlass in question is of the ordinary kind, and that the power is applied close to the handles. Now, in the experiment of your correspondent the power is applied at the extremity of the handle, a distance of 18 inches from the crank. That the result is similar to that of Desaguliers' assertion, I must admit; but we also see that to get this similarity of result, the power has to be applied at the extreme point of the handle. Doubtless, if Desaguliers had asserted that the power exerted was in the proportion of 60 to 30, instead of 35 to 30, your correspondent would have obtained a result remarkably similar, by simply applying the power at a sufficient distance from the crank. I will now endeavour to show that the power of two men, as applied to a windlass, is exactly double that of one man. The main argument of Desaguliers' adherents is, that the power of one man varies with the different positions of the handle, and at certain points attains its maximum and minimum; so that if at one point of the handle's path he can only exert a force of 30 lbs., then 30 lbs. is the weight he is able to raise, though at certain points he is able to exert a force of 100 lbs. A very little study will suffice to show that this is an error; for if otherwise, all our present methods of calculating the power of different machines must be wrong, as will be sufficiently shown by the instance of a steam cylinder, in which the steam is cut off at a portion of the stroke; supposing it is admitted at a pressure of 45, and extended down to 10 lbs. per square inch, then the effective power of the cylinder will be the area × by the minimum pressure, 10 lbs.; whereas we well know that the effective pressure is somewhere between 10 and 40 lbs.; and it follows that the weight raised by one man is equal to the average,

and not the minimum amount of pressure exerted. If the weight raised is equal to the minimum power exerted, I would ask, What becomes of the extra power exerted when the handle is in its most favourable positions? If your correspondent will take the trouble to enter into a little calculation upon the subject, he will see that the power exerted by one man varies, but that by two men is always the same; and that if the average pressure exerted by one man be doubled, it will be exactly equal to that of two men.

I am, Sir, yours, &c.,
JNO. TRURAN.

October 23, 1855.

[We really do not consider the further discussion upon this subject, which Mr. J. Truran invites, necessary. He does not treat the question accurately. His mistake apparently consists in failing to distinguish sufficiently between the "work done" in raising a body, and the "weight" of the body raised. The "power of different machines" is by no means measured by the resistance which they overcome only; it is always expressed by a product, of which the factors are the resistance, and *the space through which the point of application of the resistance is moved.* The "effective steam pressure" of an expansive engine undoubtedly lies between the maximum and minimum pressures exerted by the steam in the cylinder; but what has this to do with a man raising, by means of an ordinary winch, a weight greater in amount than that which would balance the minimum pressure exerted upon the winch-handle? If Mr. J. Truran will only consider the circumstances that exist, supposing the weight at rest, and the position of the handle that at which the man can exert his minimum pressure only, he will see at once that if the weight be slightly greater than that which the minimum pressure can balance, motion cannot ensue. What we say is, that if to another handle, at right angles to the former, a man of equal strength with the previous one apply himself, and the weight be doubled, motion will ensue, because this second man is, by the nature of the case, able to exert a greater pressure than the other. If Mr. J. Truran, or any other correspondent, can show this reasoning to be unsound, we are quite willing to afford him space for his demonstration.

We are quite aware that, supposing a momentum is generated in the weight before the handle attains the position of minimum power, the weight, though greater than that which would balance that minimum power, might be kept in motion by the man at the handle, since the momentum generated would enable him to carry the handle through that position. This, however, has really nothing whatever to do with Desaguliers' proposition, nor with the arguments we have before adduced in support of it. We repeat what we before said (vol. lxii., page 370, No. 1654), and what has not yet been proved false, viz., "It is evident that the force which a man is able to exert upon the handle of a windlass varies with the different positions of the handle, and at certain points attains its maximum and minimum; and it is equally clear that the greatest weight which he can raise by means of the windlass is determined by the minimum, so that if at one point of the handle's path he can exert a pressure of no more than 30 lbs., then 30 lbs. is the greatest weight which he can raise; and if another man (of equal strength, as must be assumed) be set to work upon the same handle, the two will be able to raise no greater weight than 60 lbs., while if the second man be applied to a handle placed at such an inclination to the former that when the first is exerting 30 lbs. pressure he is exerting 40, it is plain that the two together will in that case be capable of raising a weight of 70 lbs." This statement, though subject to a few limitations, which are omitted in order that circumlocution may be avoided, cannot fairly be gainsaid.

In conclusion, we remind Mr. J. Truran that his observations, though allowed their full weight, can scarcely be expected to show that Desaguliers is wrong in alleging that a *gain of ease* (and consequent economy of power) results from the arrangement he mentions; and this is really the gist of the whole discussion.—ED. M. M.]

EXPANSIVE MARINE ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—As Mr. J. Truran has not named any of the scientific journals which he alleged had discussed the merits of Craddock's engines, I conclude he has discovered his error, and ascertained, what is the fact, that all competent persons knowing their details to be indisputable, no one has ever ventured a single word against them. As Mr. Allen has also said nothing since I replied to his challenge, silence must be interpreted as assent, and, I assume, he admits his proposed engine is fairly beaten. The truth is, these engines are making their own way slowly and unaided; the inventor's views have, since they were first promulgated, entirely revolutionized practice on the economy of steam; an effect greatly aided by his indefatigable perseverance in demonstrating the soundness of his views by increasing perfection in their practice.

When, in 1852, Mr. Fairbairn, basing his

views on the increased economy in locomotives by that increased adoption of the expansive principle which ensued on the publication of Mr. Craddock's lectures in 1845, recommended in a pamphlet the use of steam at 50lbs. per inch in marine engines, I recognised this recommendation as a proof how much the perseverance of one man can effect, and the vitality which is in true science, even amid the most united efforts to crush it by silence and neglect. When, in the present year, Mr. Fairbairn mounted in the scale to the same height which Mr. Craddock had originally proposed fifteen years before, and came out with the recommendation to use steam afloat as high as 200lbs., I considered this a grand triumph of the force of obscure truth, in forcing its way to worldly recognition. Mr. Fairbairn's great mistake, if I understood him rightly, was the proposal to generate such steam in our ships, by the weighty, dangerous, and costly locomotive boiler. Use a proper boiler and condenser, and then all he predicts is true. The main obstacles in this country to national improvements are, the Government and the scientific institutions. The latter are most valuable and useful for their avowed purposes of collecting and promulgating a certain amount of knowledge. But all history shows, that it is in such bodies that the first and the last stand has been made against the advancement of truths which comprehensively alter existing theory and practice. Thus endowed universities are recorded to have been always the strongholds where defeated error has made its obstinate final resistance. Some absorbing theoretic doctrine, such as the Aristotelian logic, or the Newtonian perpetual motion, being once established, it is refined upon, perfected, and perverted by generation after generation of professors, into a final system, which the original inquiring propounder never dreamed of, and would repudiate, (for great philosophers are never finality men,) could they view their suggestions, rigidly incrusted and overloaded by the traditions of men, under the increased light with which time surrounds them. Smaller bodies are obvious to the same natural course; and it is a remark notorious in their history, that academies of arts and literature, and learned societies, first founded by a few great and original minds, do not proceed with the force of progress which created them, but serve more as vessels to store and deliver out their founders' views, sometimes pure, and sometimes in mixture; and with small additional contributions received from time to time, they supply useful magazines for ordinary wants, but never effect any great achievements in progress. They preserve knowledge from falling backward, but anything new and important has again to be effected by the energies of individual minds, most commonly even in defiance of the old and theoretical conservatives. The same disposition to keep things pleasantly going as they are, renders our Government such an effective and deadly foe to important progress, instead of being, as it ought to be, the leader in it. The events of the present war have made this tendency prodigiously conspicuous, until it is from peer to peasant a common topic of remark. Yet there is some difficulty in accounting for the uncommon obstructiveness of official science, because it does not reject every new thing; on the contrary, much is accepted for experiment; but, some way it chiefly happens, that it is the worthless which is received on trial, and the valuable neglected. The official eye seems to demand a peculiar medium to exercise the art of vision. We all know the prolonged blindness of the Admiralty to Ericsson's screw, although the common eye actually saw them dragged along the Thames by it. A curious instance of this conservative stolidity of vision has lately occurred. A mere saving of coal from 3lb. to 1lb. for a given power, as effected by Craddock's engines, did not tell on the apathetic Admiralty; something more *ad captandum*, savouring more of the marvellous, was laid before it—for strange varieties will often take the fancy even of the civilized savage; and, in consequence, an officer was dispatched from the Board to examine the engine of a saw-mill in Pimlico, *working without any coal at all.* From its perfect development of the expansive principle, this engine was doing the work, which required with a common engine thirty tons of coal weekly, with no other fuel but the saw-dust and refuse of the mill. The visitor stated candidly, on entering, that such a fact could not be believed: and he was requested to watch the firing for a week or for a month, as leisurely as he had come unexpectedly, if he thought proper. But two hours satisfied him, and he left, leaving a message for the inventor "to see him." At an interview, he admitted, though with some hesitation, that what he had seen he had seen, but such a statement *would not be believed;* and, besides, he added, *he had no faith in the expansive action of steam*—that they had tried it in the Dockyards, and it was of no use. This may be very true, for I have been told that there is not an engine in the navy afloat with even the ordinary proper jacketting for the cylinders; and that, in consequence, the best experiments that have been made for using expansive steam, failed to reach a cut-off beyond half-stroke without absolute loss. Be this as it may, a person who has no *faith in expansive steam,* is dis-

patched as a competent officer to report upon an invention which, *if it did what it was doing*, is capable of saving this nation yearly thirty millions in cost of coal, and cost of freight space. In a month after this competent inspector had thus set his *faith* against his *vision*, Mr. Craddock received the usual form:—"My Lords Commissioners of the Admiralty are not prepared to make trial of your engine."

Can we wonder after such instances of stupidity, or blind unbelief, that despite the energy and bravery of individuals, the disastrous follies of official wisdom have made us the laughing-stock of the world, and that "the nation of lions ruled by asses," is the honourable *soubriquet* we have gained?

I am, Sir, yours, &c.
DAVID MUSHET.

October 23, 1855.

THE PROJECTILE AND ASTRONOMICAL CONTROVERSY.*

ASTRONOMICAL OBSERVATIONS—MOTION OF BODIES.

To the Editor of the Mechanics' Magazine.

SIR,—In order to guard myself against misconception, I think it advisable to say a few words suggested by Mr. Hopkins' letter in your last week's number. It is very true that the observed apparent diameter of the sun is taken by astronomers for the *true* apparent diameter, because being a *differential observation*, and the whole difference of angles observed being so small, the astronomical corrections to be applied (also differentially) are to all intents and purposes the same. Besides, when measured *horizontally* (as is usually the case), the sun's apparent diameter is *entirely* free from all error of refraction, on the supposition that the common laws of refraction apply to the atmosphere, and also those of parallax. Mr. Hopkins is the only observer who has discovered a difference in this apparent diameter at different hours of the same day, except very near the horizon, where it is notorious the refraction is very great, and its law not well defined. We must be excused if we suspend belief in his results until they have been confirmed in other quarters.

In the mean time it is well that your readers should be aware that, although Mr. Hopkins makes merry (as ignorant people are very apt to do) with the notion of reducing observations to the centre of the earth, astronomers, by a beautiful, but simple theorem, do make this reduction, which is absolutely necessary in a large class of astronomical observations. In fact, a gentleman who so ostentatiously parades his ignorance of *parallax*, and the important part it plays in astronomy, cannot be considered very competent to maintain a part in a controversy in which astronomical questions are at issue, still less to correct received astronomical theories. Mr. Hopkins is anxious also, it seems, to parade his ignorance of what astronomers understand and wish to express by the term *mean* as opposed to true, applied to true velocity, &c. They have not the slightest idea of so avoiding errors arising from atmospheric illusions, &c. All errors of this kind, where they affect observations, are corrected at once, and the observed places of the heavenly bodies reduced to their true places.

If the sun's orbit were circular and uniform, there would be no necessity for the use of the terms *mean* velocity and *mean* diameter, as these elements would in that case be invariable.

It would, of course, be extremely inconvenient, more especially in a civil point of view, if our measure of time were variable; and hence the necessity of *mean* solar time, as well as *true* or *apparent* time.

The difference between mean time and apparent time, commonly called the equation of time, arises from two causes—1st, the obliquity of the ecliptic, that is, its inclination to the plane of the equator, which, even if the sun moved uniformly in the ecliptic, would produce a variation in the length of the day at different periods of the year; and 2ndly, the unequal motion of the sun in the ecliptic, which produces a further variation. The difference between mean and apparent time, arising from these two causes combined, sometimes amounts to as much as fifteen minutes; while four times a year this difference of time vanishes. If only one of the causes I have mentioned were in operation, this difference could vanish only *twice* a year, and in no case would it reach to fifteen minutes. To ascribe the variation in the arc of the ecliptic described in the same interval of time at different periods of the year to refraction, is simply to ascribe an effect to a cause which is incapable of producing it. I repeat it; astronomical computations are always made from the *true* places of heavenly bodies reduced from the observed places by

* As but little good will result from the continuation of this controversy, we shall insert no further letters respecting it, unless justice to either of the disputants, or something of similar importance, should render it necessary for us to find space for an additional communication. We purpose, however, shortly publishing an article upon it, in which we shall attempt rather to re-state the questions discussed, and to reason soundly upon them, than to satisfy those who have taken part in the controversy. By this course, although we shall inevitably provoke discontent, we shall, nevertheless, place our readers in a better position than they would occupy if we either left the dispute in its present imperfect form, or sacrificed the high interests of truth to the lower interests of persons. —ED. M. M.

the application of all the astronomical corrections; and the reason that the true and observed apparent diameters of the sun are the same is, that these corrections do not affect direct observations of this kind which are of a *differential* nature.

In his reply to "O. P. V.," Mr. Hopkins says, that so far from calling in question the principle of the equivalence of action and reaction, he employs it to maintain his argument.

There is no evidence, however, in his letter that he even understands what this principle means. He substitutes for this principle what he understands by the laws of composition and resolution of forces. He says, "If a material particle propelled by a force be made capable of continuing for ever in a straight line, moving over equal spaces in equal times," &c. A material particle propelled by a continuous force in the manner supposed, is simply *incapable* of conforming to the conditions of uniform motion. Its motion would go on in that case increasing without limit. Who does not know that if bodies be allowed to drop to the earth from different heights, under the action of gravity, they will reach the earth with very different velocities (proportional to the square root of the height through which they have fallen?) According to Mr. Hopkins, if I understand him rightly, they ought, being under the action of an uniform force, to move uniformly. Mr. Hopkins seems unable to grasp the principle that if two or more forces be such as of themselves to be in equilibrium, so that if applied to a body at rest they would produce no motion, they may be conceived to be removed, and the state of the body's rest or motion would be unaffected. Suppose equal weights of two substances placed in the pans of a balance, the balance is horizontal; and it still remains so if additional equal weights be added or subtracted, and it would still remain horizontal if both the pans were relieved of their loads altogether. This affords a simple illustration of this principle; and a little reflection will serve to show that what is true in this case is true in every other, viz., that forces which of themselves are in equilibrium, may be supposed to be removed without altering the state of rest or motion of the body to which they are applied.

Nobody denies that an unbalanced force applied to a particle would cause it to *proceed*. Mr. Hopkins's fallacy consists in this, that he compares the motion of the particle in such a case (which *must* be *accelerated*) to the *uniform* motion of a particle.

The difference between a material heavy particle or body moving uniformly (and therefore under the action of no force), and the same body at rest, is, that the former has an amount of *vis viva* which, meeting with no resistance, it retains intact, and which it is incapable of expending in overcoming a resistance should it meet with one; while the latter, being at rest, has no *vis viva* to expend in this manner. Thus, if W be the particle, g the accelerating force of gravity (32·2 feet), and v be its uniform velocity, $\frac{1}{2}\frac{W}{g}v^2$ is the amount of work which it is capable of expending in overcoming a resistance. If we, by any contrivance, stop this body, we in fact expend this amount of work upon it; and if we *then* leave it to itself, it will remain stationary. If we apply an uniform force of P lbs. to stop it, the body will move through the space $\frac{1}{2}\frac{W}{g}\times\frac{v^2}{H}$ after the force has begun to act upon it, and will then stop; supposing, of course, the force P then to cease its action.

There is no real paradox in the case put by Mr. Hopkins; for if you stop the particle, you of course apply a force to do so, and apply it in such a manner as just to destroy the *vis viva* the particle possesses. In fact, the particle with the uniform motion may be conceived to have been for a certain time subjected to the action of an unbalanced force until it has acquired the velocity with which it is moving, and that the force is then removed. The effect is, that a certain amount of motion has been generated in it, which motion can only be destroyed by the action of an *equivalent* force in the opposite direction. If, therefore, there be no such force, the particle (now strictly under the action of no forces) will go on moving uniformly.

If you think it worth while to insert these few observations, I shall be well pleased; but if you require your space for more valuable matter, I shall be equally well pleased by your omitting them, and remain

Sir, yours, &c.,

W.

London, Oct. 30, 1855.

LAWS OF MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—It is much to be wished the argument in this case could be confined under short, plain, unmistakable propositions. I hoped this point was reached when we assented on both sides that the issue lay between the affirmation and denial of the first law of motion. "W." as holding the affirmative, was asked to produce but one physical proof of this law out of the "cases of motion almost innumerable," which, he alleged, were in accordance with it. He, very singularly, to illustrate this ancient

abstract law of forceless motion, selected a modern locomotive, driving under the *vis viva* of an active consumption of water and coal. What we required was, a case of motion perpetuated by no steam, no coal, "no nothing." What "W." alleges is, that if the thrust of the engine is exactly balanced by the friction and the air's resistance, the train will continue to move uniformly *without a force*. Without preponderating a force it certainly will be in such a case, and it will uniformly stand still.

I regret much, with "W.," that these valuable theories do not find their way into practice in this country, and become adopted here, as "W." says they already are in France. Our railway interests are at a bad pass, and the saving of coal by working trains with no more force than was required to balance the friction and the atmosphere would be very great indeed. I am no rat-catcher, to lay baits, nor a hooker of fish too heavy for convulsive twitches of argument to bring to land; but I must say, I wish an instance more conformable and more contemporaneous with the simple data of the assumed first law of motion had been selected to illustrate it. I see from "W.'s" last letter, that he professes to consider Newton as an acting pupil of the great author of the *Novum Organon*, who not only taught us the danger of the *idola* of systems, but showed the way to avoid them by his example, in the investigation of heat, where he arrives at a definition, which it will be difficult, even with our immense subsequent discoveries in natural science, to add anything to, or diminish anything from. Now, it is certain, that in this true course of induction, the "observation" of a railway train did not form one of the particulars out of which Newton generalized his first law of motion; and, as "W." asserts he was an inductive philosopher, a statement of some of the steps by which the law was reached, would, I think, do far more real service in clearing the controversy, and rendering it intelligible, than the digging a supposed impassable gulf between the minds of "theoretical" and "practical" men.

Let us have the steps based upon known facts, by which it was ascertained that a body projected in a certain position in space would continue to move after the projectile force was exhausted. Innumerable interesting particulars arise out of the inquiry. What was discovered to be the exact suitable position for the act of projection? Did the act take effect in the existing orbit, or at some, and if so at what, distance from it? When did the projectile force attain its zero, and the forceless uniform force begin its motion? Was it before the orbit was reached, or was there enough left to describe one, two, or how many of the infinitesimal diagonal curves delineated in elementary works? At what height above the surface of the earth was it found that the action of gravitation, which is within our common range, retards the motion of bodies until it brings them to rest, ceased to retard the motion of the bodies moving without a force, and, instead of bringing them to rest, assisted its perpetuity by each successive act of deflection? Supposing the gravitating force, instead of emanating from a spherical surface, proceeded from a plane superficies parallel to the direction of the motion of the bodies moving without a force, was it found that it equally assisted in perpetuating the motion? Again, supposing that a body in free space, that is, within the sphere of gravitation, for we know and treat of no bodies in a space where gravitation does not act, is set moving at a velocity equal to the smallest fraction of our smallest measure of space in one second of time, or at a velocity of as many hundred miles per second as the fastest planets, will the perpetual motion continue at the same unaltered velocity in both cases, or will there be any variation in the perpetual velocities; and if so, according to what law? If "W." has faith in his assertion that the Newtonian astronomy is a true instance of induction from particulars to generals, all these cases, and many more, must have been subjected to the "*experimentum crucis*;" yet I find none of them mentioned in the elementary works recommended. A commanding analysis and *exposé* of such various conditions, is surely a theme in which mathematicians might not only vindicate their supremacy, but disprove the insinuations of malicious wits, that there is an inherent antagonism between philosophy and common sense. And before the discussion winds up, we ought to have some metaphysics upon the natural state of matter,—whether that state be one of rest or motion; or whether it has two natural states indifferently. Before the illumination of a true philosophy,

"All this without a gloss or comment
We should unriddle in a moment
In proper terms such as men smatter
When they throw out and miss the matter."

I am, Sir, yours, &c.
DAVID MUSHET.

Oct. 29th, 1855.

ASTRONOMICAL MEASUREMENTS.

To the Editor of the Mechanics' Magazine.

SIR,—Fully appreciating the importance of not letting one controversy occupy too much of your space, I still venture to send a few words in reply to the questions which Mr. Hopkins addresses to myself.

The information and proofs which he requires, may be found in the article on conic sections in Hutton's Mathematics, Newton's Principia, and La Place's Traité de Mécanique Celeste. The last, indeed, alone answers all his questions, except the almost self-evident one, how the circle is a conic section.

The sun's distance is obtained from his parallax. Its variations show the eccentricity of the earth's orbit independently of his apparent diameter.

The variations in the length of the revolutions of the moon show that eccentricity, on account of their depending on the variations in the sun's attraction, which depends on his distance.

The words which Mr. Hopkins puts between inverted commas, are in a different sense and connection from that in which I used them, as will appear by reference to the passage.

It was not the sun's apparent diameter, but the variation which the eccentricity assigned to the earth's orbit would produce in it, that I stated to be too small to be visible to the naked eye.

The description of his instruments should have stated the power of the telescopes and the radii of the circles. Sextants and theodolites, although made by the best makers and well fitted for the purposes for which they are constructed, cannot be expected to compete, in these respects, with the instruments used in modern observatories, with which, and not with those of Kepler, they must be compared, if the received system is to be overthrown.

I cannot see in what part of his reply to "W." he has answered that part of my letter, which is not noticed in his remarks to myself. It was on that part that I laid the greatest stress.

If my statements as to the views of astronomers are proved by La Place's treatise to be so, my arguments, to show that his observations do not interfere with them, should be answered or acquiesced in.

I am, Sir, yours, &c.

J. E. Nelson.

SCIENTIFIC AUTHORS—PRACTICAL ENGINEERS.

To the Editor of the Mechanics' Magazine.

Sir,—Practical engineers ought to be exceeding grateful to you for so frequently and so effectually overthrowing the false gods who seek to have dominion over them. It is really most gratifying to know that spirits like Professor Hunt, Messrs. Hann and Gener, Rawson and Griffiths, Kipping and Fincham, my Lord Robert Montagu, *&c., &c., are* by means of your exertions, now *lying low in the dust,* instead of stretching injurious little sceptres over the poor half-bewildered heads of practical men.

I am, moreover, very pleased to observe, Sir, that you have another method of getting rid of their enemies beside that of executing them: viz., that of encouraging them to suicide. This appears to be the plan you have chosen for disposing of the bold and ubiquitous Mr. Hopkins. At any rate, whatever your intention may have been, there can be no question as to the consequence of his recent letters in your pages. "W." has not murdered him; his own rash hands have done all. By this I do not mean to underrate either the strength or the skill of "W." He is an admirable champion, in whom we rejoice. His weapons are well-tempered; his eye is keen; his aim sure; his stroke heavy; his thrust irresistible. Give him a stalwart foe, and you shall see noble practice. But with Mr. Hopkins before him, it is not battle; it is mere sword-crossing with one who slashes himself.

But, passing by this, permit me to say, with great gravity, that practical engineers repudiate the leadership of Mr. Hopkins. It is, as you say, Sir, "a certain class of engineers" who esteem him as an authority, and that class is a very limited one—a class which probably contains but one man of considerable talent (Mr. Mushet), and which will not contain him long, I should think, unless Mr. Hopkins takes to silence very speedily.

The truth is, Mr. Hopkins possesses neither the fairness, the taste, the knowledge, nor the acumen—neither the length, the breadth, the depth, nor the height—to qualify him for a leader. In the present discussion he has met logic by declamation—argument by assertion—proof by contradiction—close reasoning by evasion. He has relied upon bold speech, vague expressions, wandering allusions, and the evidence of "Captain Smith of the Futtel Oheb." He has railed at Newton, and called his masters "presumptuous schoolboys." What he has not been foolish enough to misconceive, he has been disingenuous enough to avoid. If all Englishmen had been such as he, from the middle ages forward, I verily believe we should this day have fancied the earth flat, have listened for the music of the spheres, and have believed in the poor old Pope of Rome; for I see not how science, or art, or literature, or religion, could in that case have progressed among us.

As I am most anxious that you should insert this, I purposely make it very short. Above, I have heaped assertion upon assertion. If proofs are required by Mr. Hopkins and his clique, I shall offer them none. They have slighted proofs so often, that I

feel no encouragement to furnish them with more. Others who have read the discussion will have the proofs already in their minds. I have spoken nothing that every reader of yours has not the means of verifying.

In conclusion, Sir, I beg you will not exclude this letter. Mr. Hopkins has used practical engineers as his own: permit me to proclaim their independence of him. Many of that class are deficient—sadly deficient—of scientific knowledge, as "W." very truly remarks. But they have much more confidence in the teachers of received science than in self-constituted authorities; and Mr. Hopkins will have to pipe for a long time before many of them will dance to his music. I am, Sir, yours, &c.,

SPECTATOR.

London, Oct. 27, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

GEDGE, JOHN, of Wellington-street, South, Middlesex. *Improvements in the mode or modes of transferring designs on to woven, textile, or other fabrics, or on paper, and in the machinery used for such purposes.* (A communication.) Patent dated March 27, 1855. (No. 675.)

The inventor describes an apparatus comprising a stone or zinc roller, upon which the design to be printed is drawn, and over which the fabric passes as it is unwound from a loose roller, the former roller being supplied with ink, and the fabric being pressed upon it by a third, which is screwed down against it.

GOODYEAR, CHARLES, of Avenue Gabriel, Champs Elysées, Paris. *A new mode of moulding India-rubber and gutta percha.* (A communication.) Patent dated March 27, 1855. (No. 677.)

In carrying out this invention the gutta percha or India-rubber, when in a plastic state, is placed in a vessel having a plunger working in it, by means of which the plastic matter is forced through a small passage out of the vessel into a mould, the opening into which is held opposite the passage from the vessel.

TURNEY, GEORGE LEONARD, of Wood-street, Cheapside, London, needle and pin-manufacturer. *An improved mode of arranging or packing pins and needles for sale.* Patent dated March 28, 1855. (No. 680.)

Instead of folding up the needles in thin flat packets, the inventor wraps paper around them, and sets them up on end (in given numbers), in an annular or other shaped groove or space made to receive them in a small box or case. The pins are arranged in a somewhat similar manner, being stuck into a length of paper, which is folded so as to cover their ends, and leave their heads exposed.

PERRING, JOHN SHAE, of Radcliffe, Lancaster, civil engineer. *Improvements in the permanent way of railways.* Patent dated March 28, 1855. (No. 682.)

Claims.—1. The application of detached checks or clips for confining the rails to chairs affixed to sleepers, such chairs and checks or clips extending downward below the rails, and being drawn together by bolts or other apparatus. 2. As applied to crossing points, constructing them so that they may be used with either side upward.

HUDDE, FRANÇOIS ETIENNE, mechanical engineer, and JEAN BAPTISTE EMMANUEL FOUQUET, gentleman, of Rue de l'Echiquier, Paris. *Certain improvements in the construction of pyrometers.* Patent dated March 28, 1855. (No. 684.)

In applying the improved pyrometer to bread and other ovens, the copper rod communicating motion to the registering apparatus passes throughout the whole length of the arch of the oven, and is fixed at the end opposite to the apparatus on an iron bar. In order that the expansion shall take place only on the side of the indicating dial, the top part of the rod is covered over by a piece of cast or sheet iron suitably fixed to the arch of the oven. The rod is in connection with a wheel and rack.

HUTCHINSON, WILLIAM, of Tonbridge Wells, Kent, stone-merchant and indurator. *Improvements in manufacturing artificial stone, and in giving colour to the same.* Patent dated March 28, 1855. (No. 685.)

This invention consists in manufacturing artificial stone of any desirable colour, by incorporating sand, loam, chalk, gravel, shingle, plaster, cements, lime, or other similar loose and friable substances, with tar, resin, or other suitable bituminous or resinous substance, and by compressing the compound mass in moulds.

DRAY, WILLIAM, of Swan-lane, Middlesex, engineer. *An improved gear for communicating power from horses or cattle for the purpose of driving machinery.* (A communication.) Patent dated March 28, 1855. (No. 686.)

A full description of this invention will be shortly given.

NICOLL, GEORGE HALL, of Dundee, Forfar, ironmonger. *Improvements in laundry-stoves.* Patent dated March 28, 1855. (No. 689.)

Claims.—1. A general arrangement and construction of laundry-stoves, as described. 2. The application and use in laundry-stoves of a lining of fire-brick, arranged in the manner described. 3. A mode of constructing laundry-stoves with separate openings for the introduction of the heaters of Italian and box-irons.

M'LOW, THOMAS, of Middle-row, Holborn, Middlesex, gentleman. *Improvements*

in screw propellers. Patent dated March 28, 1855. (No. 690.)

This invention relates to an improved form and arrangement of the blades of screw propellers, whereby the water is intended to be prevented from spreading out at right angles, or radiating from the propeller shaft by the centrifugal action of the blades.

GAUNTLETT, WILLIAM HENRY, engineer, of Banbury, Oxfordshire. *Improvements in apparatus for cutting or pulping turnips and other roots.* Patent dated March 28, 1855. (No. 691.)

This invention consists in making the knives or cutters of cylindrical machines, and also of disc machines, by pressing angular or bent cutters out of the sheet steel surface of the cylinder or disc, and when such cylinders or discs are used, the front or fixed plate of the machine is grooved to correspond with the form of the cutters so pressed out of the sheet steel.

PEABODY, JOSEPH, of Old Broad-street, London, gentleman. *Improved machinery for obtaining motive power by the action of the wind.* (A communication.) Patent dated March 28, 1855. (No. 692.)

Claims.—1. The employment of a wind-wheel, which is capable of sliding upon its shaft by the pressure of the wind, and thereby, with the aid of a counteracting spring, of contracting or enlarging the passage for the wind. 2. Securing the wind-wheel to its support by means of a turn-table.

MOWBRAY, FREDERICK WILLIAM, of Shipley, near Leeds, York, engineer. *Improvements in bearings for the axles of railway wheels, and of other axles or shafts, which improvements are also applicable to axles or shafts, and other like rubbing surfaces.* Patent dated March 29, 1855. (No. 693.)

These improvements consist in forming the bearings and axles or shafts with the rubbing surface grooved or recessed in an oblique direction, for the purpose of more uniformly distributing the oil or other lubricating matter, and thus keeping the parts cool.

GEDGE, JOHN, of Wellington-street South, Middlesex. *Improvements in the means of stopping or retarding railway trains.* (A communication.) Patent dated March 29, 1855. (No. 694.)

In this invention the breaks are so constructed "that whenever by the slackening of the speed of the train the buffers are acted upon, they not only affix themselves to the wheels, but at the same time impinge on the rails, thus effecting an increase of friction, and stopping or retarding the train more readily than when friction on the peripheries of the wheels only is used."

ANGER, FRANÇOIS JOSEPH, of Stamford-street, Blackfriars-road, Surrey, merchant. *Improvements in the preservation of vegetable substances.* Patent dated March 29, 1855. (No. 695.)

This invention consists in employing for preserving vegetables an extract from fermented grain called diastasis, which extract is first mixed with warm water to form a solution.

GILLOT, MARIE JEANNE THÉRÈSE, widow, and CÉCILE CELESTINE BEAUVAIS, of Upper Charlotte-street, Fitzroy-square, London. *Improvements in purifying grain, vegetable or botanical matter, and cochineal.* Patent dated March 29, 1855. (No. 696.)

This invention consists of certain arrangements for washing and drying damped substances.

PORRITT, JAMES, of Stubbins Vale Mills, near Ramsbottom, Lancaster, manufacturer. *Certain improvements in steam engines.* Patent dated March 29, 1855. (No. 698.)

This invention consists of an improved combination of parts to be acted upon by the governor of a steam engine, whereby the opening of the valve is regulated in proportion to the power required to be exerted.

MCDOUGALL, ALEXANDER, of Manchester, Lancaster, manufacturing chemist. *An improved method of consuming smoke in steam engines or other furnaces or fireplaces.* Patent dated March 29, 1855. (No. 699.)

This invention consists in constructing within a boiler a furnace of that class in which the smoke from one fireplace is made to pass over the hot fuel contained in another.

BLAIR, JOHN, of Glasgow, Lanark, hat-manufacturer. *Improvements in hats and other coverings for the head.* Patent dated March 29, 1855. (No. 700.)

This invention consists in the construction of hat bodies in such manner as to form a thin space between the interior surface and the outside of the hat at the part where the hat fits upon the head, such space communicating by perforations with the interior of the hat about the upper part of the head, so as to provide for ventilation.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in anchors.* (A communication.) Patent dated March 29, 1855. (No. 702.)

In carrying out this invention the flukes of the anchor are forged in one piece, and project both on the same side of the shank, to the end of which they are attached loosely by separate cheeks and tie-pieces of iron rivetted or bolted together. The flukes are passed through an opening in the crown. In most cases the stock will be dispensed with, but when used it need not be longer than half the length of the shank.

BERE, ANATOLE, government mining engineer, of Lille, France. *Improvements in steam boilers.* Patent dated March 30, 1855. (No. 705.)

This invention consists in the application of a feed pipe and diaphragm to ordinary cylindrical and tubular boilers, by which means, in combination with a peculiar arrangement of furnace and smoke box or heating chamber, the heating surface is increased.

Swain, William, of Birmingham, Warwick, gentleman. *Certain improvements in furnaces for japanners' stoves, ovens, boilers, and kilns, which improvements are also applicable to other fireplaces, by which combustion is rendered more complete, and the fuel thereby greatly economized.* Patent dated March 30, 1855. (No. 708.)

This invention mainly consists in employing perforated bricks, and bricks or tiles with cavities formed in them, for the purpose of admitting the necessary air to fires.

Tytherleigh, William, of Birmingham, Warwick, clerk of works. *The application of a certain well-known process to the covering of iron, in sheets or bars, with copper or copper alloys, whereby he produces a new and useful product.* Patent dated March 30, 1855. (No. 709.)

Claim.—The coating or covering of iron in sheets, bars, or any other form, with copper or copper alloys, by applying the granulated copper or copper alloy with a suitable flux, and fusing it by heat.

Babcock, George H., and Asher M. Babcock, of Westerly, Rhode Island, United States of America. *Improvements in presses for printing in colours, called polychromatic printing-presses.* Patent dated March 30, 1855. (No. 710.)

In this invention the beds on which the types are fixed are placed round a prism which forms a revolving platen or tympan. This platen is composed of as many sides as there are colours to be printed, with one additional side for the purpose of feeding the sheets. At each corner is hung a frisket-frame, which is pressed down upon the platen by cams acting upon rollers attached to each side of the frisket. On the shaft of this frisket, and near the centre thereof, is fitted a helical spring, which, as the face of the prism comes up, the cams releasing the frisket, raises the same to deliver the printed sheet and receive a new one. At the next turn this frisket is closed, and the succeeding one rises. The sheet is held fast when once taken on until all the colours are printed.

Prentice, Manning, of Stowmarket, and Thomas Richardson, of Newcastle-upon-Tyne. *Improvements in the manufacture of manures.* Patent dated March 30, 1855. (No. 711.)

This invention consists "in reducing fish to a tolerably uniform consistence, by boiling, or by mechanical cutting, or grinding, or tearing in water, and running the product into a reverberatory furnace, either alone or with blood, and boiling the whole down by surface heat from the naked fire either to dryness or to a less degree; and in employing dryers to absorb the moisture." The inventors employ as drying matters for these or other manures, what tanners call ross or drass, or seawood reduced to a fine powder.

Morgan, Joseph, of Manchester, manufacturer of plaited wicks. *An improvement in the manufacture of candles, in which tallow is used.* Patent dated March 30, 1855. (No. 712.)

This improvement consists in employing plaited wicks in tallow candles, or candles for the most part of tallow, which wicks are composed of less than four plaits to the inch when in an unstretched state.

Prentice, Manning, of Stowmarket, and Thomas Richardson, of Newcastle-upon-Tyne. *Improvements in the manufacture of manures.* Patent dated March 30, 1855. (No. 713.)

This improved process consists "in dissolving phosphates of lime or of magnesia in muriatic acid, to which is added gas-water or other compound, or source of ammonia, such as Peruvian guano, and mixing with such matters muriate of potash or soda; or we add," say the inventors, "sulphate of potash or soda to the first-named solution of earthy phosphates in muriatic acid, and remove the sulphate of lime which precipitates, and mix gas-water or other ammoniacal compound with the supernatent liquid."

Neale, Edward Vansittart, of Russell-place, Middlesex, esquire, and Thomas Dawson, of King's Arms-yard, London, manufacturer. *Improvements in handles and parts of handles for umbrellas, walking-sticks, knives, and for other like articles, and for articles of furniture, in stoppers, finger-plates, medallions, jewellery, furniture, and other decorative articles.* Patent dated March 30, 1855. (No. 714.)

This invention consists in manufacturing the articles enumerated in the title of glass, and in so connecting them with the articles themselves that they shall be protected from injury by falls, blows, &c.

Bunning, Theophilus Wood, of Newcastle-upon-Tyne, engineer. *An improvement in steam engines.* Patent dated March 30, 1855. (No. 715.)

This invention consists in isolating or shutting off the main or working slide or valve from both boiler and condenser, and in admitting steam through an additional valve on either side of the piston without the necessity of moving the main slide.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

YATES, WILLIAM, the younger, of Woburn-place, Russell-square, Middlesex, gentleman. *Improvements in the treatment of grain from which beer or spirit has been made.* Application dated March 27, 1855. (No. 676.)

The grain is to be taken in its ordinary wet state and by the application of any suitable pressure the moisture is to be squeezed from it, and the grain, thus rendered partially dry, is then to be completely dried by any suitable apparatus for drying purposes either with or without the application of heat, and subsequently ground.

GETTY, JOHN, of Liverpool, Lancaster, shipbuilder. *An improvement in the construction of steam and other vessels.* Application dated March 27, 1855. (No. 678.)

In order to give strength to vessels the inventor plates the opposite sides of the timbers with iron, and secures the plates together by bolts which pass through the iron and the wood, and thus forms compound ribs or frames of considerable stiffness, which are to permit the copper bolts for securing the planking to be inserted therein without coming in contact with the iron.

TURNER, ARCHIBALD, of Leicester, India-rubber manufacturer. *Improvements in the manufacture of elastic fabrics.* Application dated March 27, 1855. (No. 679.)

In making gloves, for example, on an elastic fabric the India-rubber strands and non-elastic threads which form the warp of the fabric are arranged in the ordinary way, but instead of the weft threads being passed regularly round all the strands, one of the outer strands of India-rubber, together with its accompanying non-elastic threads, is bound in by only every alternate weft thread, thereby forming a kind of false selvage between the outermost and second elastic strand, and leaving openings to receive the points of the needles of knitting machines.

MULHOLLAND, FRANCIS GEORGE, of Vincent-square, Westminster, civil engineer. *An improved mode of constructing fire-proof and waterproof roofing, flooring, and covering for general purposes.* Application dated March 28, 1855. (No. 681.)

The inventor proposes to make use of either wrought or cast-iron girders or joists for carrying the roof, floor, or covering, and when these are fitted he fills in the intermediate spaces with curved sheets of corrugated iron, the ends being turned up or curled so as to run loose on the flanges of the girders or joists, thus allowing for play in case of any sudden increase of weight, or for expansion in case of fire. The whole is then covered with a layer of porous brick or rubbish, and semi-fluid concrete, the upper surface being made fair and smooth.

HIGGIN, JAMES, of Manchester, Lancaster, manufacturing chemist. *The use of a thickener for mordants and colours for printing woven fabrics, which thickener has not been hitherto used for such purposes.* Application dated March 28, 1855. (No. 683.)

The inventor proposes to use the flour of barley as a thickener for mordants and colours used in printing woven fabrics, the said flour being first well dressed, so as to remove the bran.

REVELL, JOSEPH, of Duckinfield, Chester, plasterer. *Certain improvements in machinery or apparatus for propelling vessels.* Application dated March 28, 1855. (No. 687.)

The inventor employs two rings or rims of metal, revolving in the same plane, but having different centres; of these one is secured to the main or driving shaft of the paddle-wheel, and the other to a centre above or below the main shaft, at such a height as shall be regulated by the depth of the paddle or float employed, and the floats are so connected with these rings as to be kept always in vertical positions.

BECKER, ERNEST HANNIBAL, of Altham, Lancaster, manufacturer. *A new or improved projectile.* Application dated March 28, 1855. (No. 688.)

The inventor employs a leaden ring connected with the projectile, beneath which ring are placed two inclined planes or annular wedges, their inclined surfaces working against each other, in such manner that upon the discharge of the piece they shall press outward against the leaden ring and expand it.

BROWN, WALTER, of Catherine-street, Cornwall-road, Lambeth. *Improvements in the manufacture of sheet metal casks and kegs.* Application dated March 29, 1855. (No. 697.)

This invention has for its object "the manufacture of casks or kegs with six equal sides, when using sheet iron, tin, plate, or other sheet metal, and where such casks or kegs are made with heads with flanches by raising the edges thereof."

DALGETY, ALEXANDER, of the firm of Dalgety and Ledger, of Deptford, Kent, engineers. *Improvements in steam engines.* Application dated March 29, 1855. (No. 701.)

According to one modification of this invention—in which the crank is placed in the centre of the cylinder, or between the two working pistons in expansive engines—it consists in having the pistons either cast in one piece, or connected by rods or other suitable contrivance; in this case a single throw crank only is required connected to either end of the double piston.

JOHNSON, ROBERT, WILLIAM WHITTLE JOHNSON, and ROBERT JOHNSON, the younger, of Waterloo-place, Commercial-

[redacted]

road, Middlesex. *A new and improved covering for surfaces, linings, roofs, and spaces.* Application dated March 29, 1855. (No. 703.)

This invention consists in combining sheet metal with linen, cotton, woollen, hempen, or other suitable fabric.

JAMES, WILLIAM, of Crosby-hall Chambers, London, iron merchant. *Improvements in the manufacture of screw bolts.* Application dated March 29, 1855. (No. 704.)

This invention consists in forming bolts with a straight feather upon them, and in then heating the bolts and giving them a twist so as to turn the feather into a spiral form. These bolts are to be driven in by blows from a hammer.

PARNELL, HENRY WILLIAM, of Bryanstone-square, London. *The improvement in the construction of ships and boats, so as to increase their buoyancy and diminish their rolling motion.* Application dated March 30, 1855. (No. 706.)

The inventor proposes to build or attach to a ship's side at the water-line a strong ledge, wing, or platform level with the water, on which the ship will partially rest when properly trimmed.

CROZIER, WILLIAM, of Sunderland, Durham, civil engineer. *The better extinction of fire.* Application dated March 30, 1855. (No. 707.)

This invention consists in connecting a hydrant or fire-plug to lamp or other posts, or to any aboveground structures.

PROVISIONAL PROTECTIONS.

Dated June 20, 1855.

1405. William Cartwright Holmes, of Huddersfield, York, gas engineer. Improvements in the manufacture of gas and in apparatus employed therein.

Dated July 21, 1855.

1650. Alfred Tooth, of Mincing-lane, London, merchant. A process for preserving and curing by salting the flesh and hides of animals in an entire state.

Dated August 21, 1855.

1890. George Lewis, of High Cross-street, Leicester, Leicestershire, locksmith. Improvements in gloves, cut out with a knife and rotary press.

Dated September 15, 1855.

2081. Paul Frederick Wohlgemuth, of New Bond-street, Hanover-square, Middlesex. The construction of bridges.

2083. Henry Chandler, of Birmingham, Warwick, manufacturer. Improvements in roasting-jacks.

2085. David Hill, of Ocker-hill, Tipton, Stafford, forge manager. Preparing a material capable of resisting fire, and especially suitable for the interior of puddling and other furnaces.

2087. George Hamilton, of Great Tower-street, London, gentleman. Improvements in apparatus for weighing.

2089. Lewis Dunbar Brodie Gordon, of Abingdon-street, Westminster, civil engineer. An improvement in electric telegraphs when insulated wires are laid under water or in the earth. A communication from Werner Siemens, of Berlin.

Dated September 17, 1855.

2093. Uriah Scott, of Duke-street, Adelphi, Middlesex, engineer. Certain improvements in the construction of vehicles and the various parts of the same.

2095. Edward Gibbs, of Wolverhampton, Stafford, manufacturer. A new or improved manufacture of picture frames, vases, busts, and such articles as are or may be produced by the process of moulding.

2097. Noah Turner, of Chorley, Lancaster, gold thread and plate manufacturer. Certain improvements in the manufacture known as gold wire and gold plate for the production of gold thread or gold lace.

2099. George Copland, of Liverpool, Lancaster, practical chemist. Improved fluid compound for the destruction of bugs and other insects.

2101. Jean Hector Destibeaux, merchant, of Paris, French Empire. An improved water-proof fabric.

2103. Charles Tilston Bright, of Liverpool, Lancaster, engineer, and Edward Brailsford Bright, of the same place, secretary to the English and Irish Magnetic Telegraph Co. Improvements in electric telegraphs and in apparatus connected therewith.

Dated September 18, 1855.

2105. John Joseph Halcombe, of Magdalen College, Cambridge. Improvements in the means of obtaining skeleton maps for educational purposes.

2107. Pierre Gédéon Barry, of Gray, French Empire, chemist. Improvements in treating bituminous shale, boghead mineral, and other like schistous bodies, in order to obtain various commercial products therefrom.

2109. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of paddle-wheel, and an improved mode of mounting such wheels. A communication.

2111. James Willis, of Cheapside, London, umbrella maker. Improvements in the construction of umbrella and parasol furniture.

Dated September 19, 1855.

2113. George Arthur Biddell, of Ipswich, engineer. Improvements in railway crossings.

2115. William Rothwell Lomax, of Hammersmith, Middlesex, civil engineer. Improvements in steam engines.

2117. John Henry Linsey, of Pilgrim-street, Ludgate-hill, London. Certain improvements in account books and other large books.

Dated September 20, 1855.

2119. John Page, of Perth, civil engineer, and William Robertson, of Dundee, Forfar, engineer. Improvements in moulding or shaping metals.

Dated September 21, 1855.

2121. Asa Lees, of the Soho Iron Works, Oldham, Lancaster, machine maker, and John Clegg, of the same place, foreman. Certain improvements in looms for weaving.

2123. George Seaborn Parkinson, of Devonshire-terrace, Kensington, Middlesex. Improvements in railway breaks.

Dated September 22, 1855.

2125. William Pollitt, of Clayton-le-Dale, Lancaster, farmer, and James Eastwood, of Blackburn, file manufacturer. Improvements in apparatus for churning milk and mixing liquid compounds.

Dated September 24, 1855.

2134. John Musto, of the East London Iron

Works, Cambridge-road, Mile-end, engineer, and Frederick Bear, of Northampton-street, Mile-end, tobacco manufacturer. Improvements in machinery for the manufacture of tobacco.

Dated October 1, 1855.

2184. William Kempe, of Holbeck Mills, Leeds. An improvement in machinery for raising the pile on woollen and other cloths or fabrics.

Dated October 10, 1855.

2262. Thomas Fairbairn, William Andrew Fairbairn, and George Fairbairn, of Manchester, Lancaster, engineers. Improvements in the mode or method of casting ordnance, which improvements are also applicable to casting cylinders and other similar vessels.

2264. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for dressing flour. A communication.

2266. Thomas Oddie, of Preston, Lancaster, manager, William Lancaster, of the same place, manufacturer, and John Lancaster, of the same place, manager. Certain improvements in looms for weaving.

2268. Denis Hébert, of Rue Marbeuf, Paris, director of the Boulangerie Economique. Improvements in heating and arranging ovens. A communication from Alexis Lurine.

Dated October 11, 1855.

2270. Ramsay Richard Reinagle, of King William-street, Strand, Middlesex, artist. Improvements in barrows, hand-trucks, and other similar vehicles.

2272. Joseph Gilpin, of Leeds, York, manufacturer. An improved raising gig to be employed in the manufacture of woollen cloths.

2274. William Bailey, of Stalybridge, Lancaster, cotton spinner, and John Quarmby, of the same place, manager. Improvements in machines for carding cotton and other fibrous materials.

2276. William Bridges Adams, of Adam-street, Adelphi, Middlesex, engineer. Improvements in machinery and tools for cutting and carving wood and other materials.

2278. Richard Albert Tilghman, of Philadelphia, United States of America. Improvements in treating fatty and oily substances.

Dated October 12, 1855.

2280. Francis Puls, of Soho-square, Middlesex, chemist. Improvements in electro-coating metals or alloys of metals with other metals or alloys of metals.

2282. Thomas Moore, of Retford, Nottingham, engineer. An improved mill for grinding corn and other grain.

2284. Cornelius Ward, musical instrument maker, Great Titchfield-street, Marylebone, Middlesex. Improvements in the construction of the musical instruments designated clarionets.

2286. John Livingston, of Leeds, York. Improvements in certain parts of the permanent way of railways.

Dated October 13, 1855.

2288. James Septimus Cockings, civil engineer, and Ferdinand Potts, patent tube manufacturer, of Birmingham, Warwick. Certain improvements in sockets for whips and candles, parts of which are also applicable to the sockets or irons for holding carriage and other lamps.

2290. Germain Adolphe Thibierge, apothecary, of Versailles, French Empire. Certain improvements in manufacturing chlorine, part of which are applicable for obtaining certain accessory products.

2292. William Glen Eavestaff, of Great Russell-street, Middlesex, piano-forte manufacturer. Improvements in the construction of piano-fortes.

2294. John Moseley, of Birmingham, Warwick, engineer. Certain improvements in machinery for cleansing linen and other fibrous materials.

2296. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in power-looms. A communication.

2298. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in looms suitable for weaving wire fabrics. A communication.

Dated October 15, 1855.

2300. Charles Leftwich, of Munster-street, Regent's-park, Middlesex, lead merchant. Improvements in water closets.

2302. Thomas Weatherburn Dodds, of the Holmes Engine and Railway Works, Rotherham, York, engineer. Improvements in fire-arms and ordnance, and in the projectiles to be used therewith.

2304. Robert Benton, of Birmingham, engineer, surveyor, and land agent. Improvements in obtaining motive power by leverage.

2306. Enrico Angelo Ludovico Negretti and Joseph Warren Zambra, of Hatton-garden, London, meteorological instrument makers. Improvements applicable to self-registering gauges, thermometers, barometers, and other mercurial meteorological instruments.

Dated October 16, 1855.

2308. George Thomson, of Glasgow, Lanark, engineer. Improvements in steam-engines.

2310. William Church, of Birmingham, Warwick, engineer. An improvement or improvements in the manufacture of ordnance.

2312. John Forrest, of Dear's-place, Somers' Town, Middlesex, mineralogist. An improved mode of extracting metals from their ores.

2314. Théodore Augustin Claeijs, of Bruxelles, Belgium, engineer. Improvements in the manufacture of corks and bungs.

Dated October 17, 1855.

2316. William Crossley and Samuel Beaumont, of Hulme, Manchester, mechanics. Improvements in the manufacture of cement.

2318. Jules Hyppolite Clément, of Paris, France, proprietor. An improved break for railway carriages, parts of which are applicable to breaks for other purposes.

2322. Ebenezer Mackinlay, of Glasgow, Lanark, manager. Improvements in reeling apparatus for winding yarn into hanks.

2324. William Henry Walton, of Glasgow, Lanark, engineer. An improved machine for carding, combing, or preparing fibrous substances.

2326. John Joseph Halcombe, of Magdalen College, Cambridge. Improvements in gates.

2330. Thomas Taylor, of the Patent Saw Mills, Manchester, Lancaster. Improvements in apparatus for extinguishing fire by means of water, part of which is also applicable to governing the discharge of fluids for other purposes.

2332. Thomas Richards Harding, of Leeds, York, hackle comb and gill manufacturer. Improvements in combs, gills, and hackles, used in the preparing and manufacturing of flax, silk, wool, or other fibrous substances, and in combs for combing the human or other hair.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2345. William Basford, of Penclawd, Glamorgan. Improvements in the purification of coal gas, and from obtaining a residium therefrom. October 19, 1855.

2362. Pierre Alexandre Leroux, chemist, and Louis Réné Martin, merchant, of Paris, France. Combining a resinous matter with oils or fatty bodies in order to obtain various useful products therefrom. October 22, 1855.

NOTICES OF INTENTION TO PROCEED.

From the "London Gazette," October 30th, 1855.)

1375. Lazare François Vaudelin. Improvements in railway breaks or brakes.

1380. Richard Peaker and Thomas Bentley. Improvements applicable to machinery for grinding wheat and other grain, cement, and other substances.

1397. Francis Burke. Improvements in preparing pulp or pulpous material applicable in the manufacture of paper and for other useful purposes.

1399. Daniel Gover. Improvements in the construction of gun-carriages and appliances connected therewith.

1400. James Letchford. An improved construction of folding bedstead.

1401. John Henry Johnson. Improvements in machinery or apparatus for emptying cesspools and privies. A communication.

1405. William Cartwright Holmes. Improvements in the manufacture of gas, and in apparatus employed therein.

1423. Jacob Ben' Jamin. Improvements in apparatus for the manufacture of gas. A communication.

1424. Theodore Boujereau. Improvements in apparatus for roasting coffee.

1426. William Basébé. An improvement in the manufacture of paper.

1432. Oliver Rice Chase. An improved machine for making lozenges and for other purposes.

1439. Herbert Newton Penrice. Improvements in machinery for propelling vessels.

1441. Thomas Walker. Improvements in projectiles for ordnance and other firearms.

1446. Auguste Edouard Loradoux Bellford. Improvements in the manufacture of bats for felting, and in machinery for manufacturing the same. A communication.

1448. John Young. Improvements in and applicable to harrows.

1454. Auguste Edouard Loradoux Bellford. Certain improvements in rotary blowing machines, which are also applicable to rotary pumps, to rotary engines to be driven by steam or other fluids, and to meters for measuring the flow of fluid bodies. A communication.

1456. Frederick Leiss and Charles Schneider. Manufacturing mica letters, numerals, shop signs, figures, arms, devices, and ornaments.

1457. James Ronald. Certain improvements in machinery for dressing manilla and other hemps and flax.

1465. Henry John Distin. Improvements in the means of rendering the ordinary field or regulation bugle chromatic.

1473. Charles Moreau-Darluc. An improved mode of separating substances of different nature or composition, by means of displacement and substitution.

1485. Henri Dembinski. Improvements in the process and apparatus for generating steam without combustible matter, except in accidental cases.

1487. John Broadbent and Stanley Peter Youle. Improvements in machinery or apparatus for cutting out the gores of umbrellas and parasols, which said improvements are also applicable to cutting out forms or shapes for other purposes.

1510. Joshua Horton and Thomas Horton. A new or improved manufacture of paper pasteboard and pulp.

1616. John Ellis. Certain improvements in the process of manufacturing ammonia, charcoal, animal and vegetable naphtha.

1652. Robert McLaren, and Stephen Williams Pugh. Improvements in the manufacture of artificial fuel and fire lighters and in moulds to be employed therein.

1682. Thomas Hewitt. Improvements in pumps.

1811. William Henry Lancaster and James Smith. Certain improvements in the manufacture of gas for illuminating, heating, and other purposes.

2011. John Hamilton Glassford. Improvements in printing textile fabrics and other surfaces.

2047. Edmund Sharpe. Improvements in pans for water-closets.

2063. Francis Gybbon Spilsbury and Frederick William Emerson. Improvements in the manufacture of paints and pigments.

2064. John Guy Proger. Improvements in ships' signal-lanterns.

2109. Alfred Vincent Newton. An improved construction of paddle-wheel, and an improved mode of mounting such wheels. A communication.

2119. John Page and William Robertson. Improvements in moulding or shaping metals.

2130. John Moreton Marchinton. Improvements in the construction of vices.

2160. John Hall Brock Thwaites. Improvements in the preservation of teeth, and in the manufacture and application of artificial teeth.

2172. William Bird Herapath. Improvements in the manufacture of surgical instruments.

2254. James Murdoch. Improvements in extracting colouring matter from lichens containing such colouring matter. A communication.

2264. William Edward Newton. Improved machinery for dressing flour. A communication.

2345. William Basford. Improvements in the purification of coal gas, and for obtaining a residium therefrom.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

495. David Crichton.
504. George Kennedy Geyelin.
519. Mathew Fitzpatrick.
524. Charles Rowley.
525. Myer Myers, Maurice Myers, and William Hill.
528. Halsey Draper Walcott.
538. Alfred Charles Hervier.
541. Thomas Wilks Lord.
547. James Henry Smith.
552. George Hattersley.
556. Charles Authur Redl.
579. Alfred Vincent Newton.
582. James Sinclair.
589. William Dantec.
590. William Petrie.
592. George Dixon.
595. Joseph John William Watson and Thomas Slater.
625. John Cameron.
646. George Fife.

662. Peter Fairbairn and John Hargrave.
721. Caleb Bloomer.
739. Amory Hawkesworth.
780. James Potter.
801. John Trestrail.
832. John Beale.
883. William Massingham.
1131. John Roberts.

LIST OF SEALED PATENTS.

Sealed October 26, 1855.

945. Auguste Edouard Loradoux Bellford.
951. Thomas Page.
957. Richard Clark and John Thomas Stroud.
959. Daniel Warren.
976. James Edward Boyd.
980. Robert Adcock.
988. Marie Amédié Charles Mellier.
1002. Robert Midgley and George Collier.
1022. James Lewis.
1030. John Allin Williams.
1034. Jules Joseph Imbs.
1054. Matthew Allen.
1058. Charles Jared Hunt.
1078. William Dray.
1114. Alexandre Maximilien Mennet.
1146. John Mahon Murton.
1188. John Allen and William Allen.
1318. Cromwell Fleetwood Varley.
1854. Francis May.
1894. Lucius Paige.
1910. William Denton.
1944. Alfred Vincent Newton.
1946. Benjamin Moore.

Sealed October 30, 1855.

965. Edward Acres.
969. Henry Francis.
973. William Eassie.
975. William Hartley.
985. Samuel William Campain.
997. Jean Pechgris de Frontin.
999. John Hamilton, jun.
1003. Joseph Beaumont.
1011. Henri Marquis de Balestrino.
1019. John Henry Johnson.
1025. Joseph Hughes.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

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Mechanics' Magazine.

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SLOUGHGROVE AND WHEATLEY'S SMOKELESS FURNACES.

Fig. 1

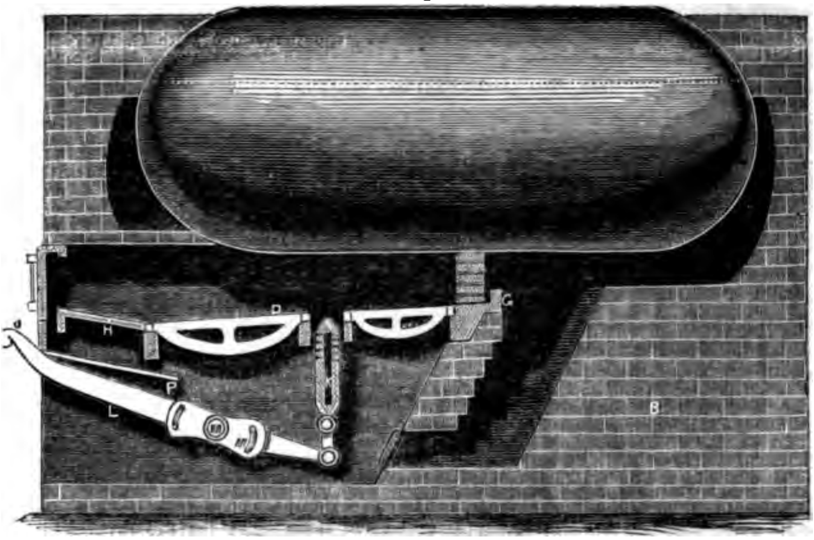
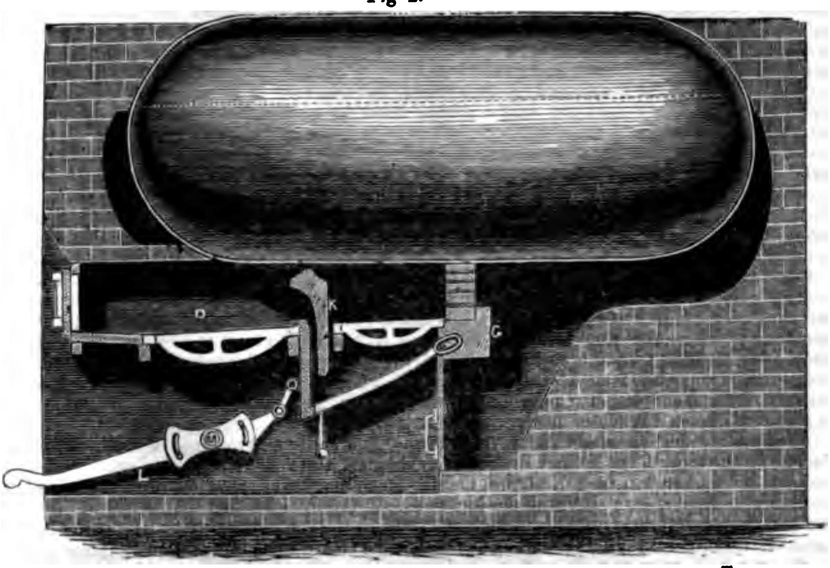


Fig 2.



SLOUGHGROVE AND WHEATLEY'S SMOKELESS FURNACES.

(Patent dated September 7, 1855.)

THE engravings on the preceding page represent certain improved furnaces which have recently been patented by Messrs. Sloughgrove and Wheatley, of Islington. Fig. 1 represents a longitudinal section of a stationary boiler with the improved furnace applied to it. A is the boiler; B, the brickwork which supports the same; C, the furnace; D and E, two series of fire bars. These incline slightly upward towards the back of the furnace. The fire bars are supported by the bearing bars F, F, and the bridge plate G. H is the dead plate; L, a perforated bridge, which may be made either of fire-clay or of metal thickly coated with fire-clay. The perforations are made of a taper or conical form, the larger part being towards the flue. Between the sets of fire bars D and E is fitted a diaphragm K, by which the after part of the furnace may be separated from the front part. This diaphragm is a double metal plate, closed at the top and sides, but open at the bottom; it is fitted in guides, which are secured to the sides of the ash-pit, so that it may slide freely up and down. The back and front plates of the diaphragm are perforated with holes *k*, *k*, not placed opposite each other; the rows in the back plate are made between those in the front plate. This arrangement is for the purpose of dividing the streams of smoke, and more effectually mixing them with the current of atmospheric air that passes up through the bottom of the diaphragm. A lever L, secured to the shaft M, gives motion to the diaphragm. This lever is made sufficiently heavy to counterpoise the greater portion of the weight of the diaphragm, so that it may be easily raised by the hand. The diaphragm is connected to the lever by two links, one of which is seen at N. This arrangement admits of the diaphragm moving in a perpendicular direction, notwithstanding the curve described by the end of the lever L. M is a quadrant, for the purpose of adjusting the position of the lever L. The furnace is fitted with what is termed a trunk front O, that is to say, the iron-work of the front projects, and is connected with the plate P, in order to afford a communication between the furnace and the space below the fire bars. This arrangement is for the purpose of carrying off the small quantity of smoke that would otherwise hang near the furnace door, in consequence of its being beyond the influence of the draught; by having this passage for its exit, it is conveyed below the fire bars D, and up through the fire. The fire bars E, are supplied with fuel from the front fire; and to do this the diaphragm is lowered, and a sufficient quantity of incandescent fuel is pushed back upon the bars E. The diaphragm is then raised, and the coal is thrown upon the front fire in the ordinary manner; the smoke arising from its combustion passes through the holes of the front plate of the diaphragm, where it is mixed with the current of air which passes up between the plates. "The smoke and air," say the inventors, "are carried in divided streams through the back plate of the diaphragm on to the bright fire upon the bars E, by which they are instantly flashed into flame, which passes through the perforated bridge I; this perforated bridge prevents the smoke and air passing off to the flue before it is thoroughly ignited, and this bridge may also be made moveable, like the diaphragm K."

Fig. 2 represents a modification of the foregoing improvements. In this case the products of combustion are made to pass from the first fire down beneath the second set of fire bars, and up through that fire to the flue. When the diaphragm K, is down, the smoke at once passes off to the flue or shaft; but when it is raised, as in the figure, the products of combustion take the course indicated by the arrows, and pass through the back fire, which is kept in a state of intense ignition. The others parts of the details are sufficiently obvious, and do not require describing in words. This arrangement may be applied to any form of construction of furnace.

Another modification of the improvements of Messrs. Sloughgrove and Wheatley consists in fitting beneath the furnace bars a moveable plate, in such manner as to shut off the communication between the ash-pit and the flue or chimney, and thereby causing the air necessary to support combustion of the fuel to ascend through the fuel at the front of the fire bars, and descend through the incandescent fuel at the back, carrying with it the smoke or unconsumed gases. In this arrangement the fire bars are supported in a frame or *cradle*, *moveable* upon an axis, so that the fire grate may be raised or lowered by means of a *lever extending* in front of the ash-pit.

[redacted]

IMPROVED BORING TOOLS.

(English Patent dated August 26, 1854.)

Patents have recently been obtained in America and this country for "improvements in boring instruments known as augers, bits, or gimlets," the invention of Mr. Ransom Cook, of the United States. The improvements are of a valuable character, and will tend to very considerably diminish the work expended in boring. To shipwrights and others, of whose labour this operation forms a considerable and laborious portion, the invention will be of great utility. It was suggested to the inventor by the microscopical examination of an insect.

The improvements consist in giving to the lips or cutting edges of boring implements a curved or gouge shape at their extremities, as illustrated in figs. 1 and 3, also in the under cutting or back sloping of those edges, as illustrated in fig. 2, between A and B, in order to give them a sliding or drawing movement in cutting. To enable others to make and use the improved instruments, the inventor describes their construction and operation as follows:—"The body of the boring implement may be forged for this purpose in almost any of the forms now used, but my cutting edges are most easily adapted to the twist or screw auger and the centre bit. In drawing or plating for the screw auger with edges on my plan, the extreme or cutting end should be left about square, and thicker than for the ordinary lips. In hammering out the lips before turning them, they should be extended from the screw or centre farther than for right angular lips. These lips should also be hammered so as to have some projection downwards, that is, project from the handle end, somewhat in the form of a swallow's tail. Being thus forged, the lips may be turned nearly or quite in the form shown in

Fig. 1.

Fig. 3.

fig. 1, in case the boring implement is designed to work with the greatest ease; but when a greater smoothness is essential in the hole to be bored with the instrument, the lips may be turned in the form of fig. 3; while, for the purpose of boring endwise of the wood, the auger and lips should have

Fig. 2.

Fig. 4.

the form given in fig. 4. After the hammer work is finished, the lips, except those for boring endwise, are to be filed or dressed with the under back slope, as shown in fig. 2, from A to B. No particular angle is essential in this slope, but the augers seem to work best and easiest when the slope is at about 45 degrees from the body of the auger. These implements are then to be tempered, finished, and used in the same manner as the ordinary kinds. For boring endwise, the lips should have the upper back slope, as shown in fig. 4, from A to B. These boring implements will be found to cut so much easier than those now in use, that they require much less stock on their bodies, and but a small screw to hold them to the wood."

The *Morning Chronicle*, of October 20, contained the following remarks upon the invention:

"We have lately witnessed some experiments with improved American boring tools, of so conclusive a character as to convince us that the true principle of construction for these implements has been discovered. The superiority in these tools over anything hitherto known consists, first, in the extraordinary ease with which the hardest woods may be bored with the largest sized augers at any angle to the fibres, the perfectly cylindrical character of the hole, the tools neither bruising nor tearing the wood in the slightest degree. The formation of a fine threaded female screw, by means of this instrument on the interior surface of the boring, adds greatly to the firm hold of a 'treenail' or bolt when driven home. Another most valuable result is, the absence of any projecting spur which is liable to be broken off by contact with metal when in

use, while the slight exertion required in boring enables the workman to detect at once the presence of a spike or bolt. The efficiency of the tools is also but little impaired by injuries which would render an ordinary tool totally useless, and even one of the cutting blades of the screws at the end of the improved augers may be broken off, and the tool will be found as effective as before, the only difference being that it works but at half speed. * * * Another great advantage would be derived by the workers in expensive timber, by the material not being in the slightest danger of splitting, however near the edge the hole may be pierced.

"The first experiment performed in our presence was on a piece of common five-eight spruce deal, with 1-inch augers. With the old auger no hole could be bored, the wood invariably splitting as soon as the auger made a cut; with the new tool half-a-dozen borings were made in succession, so close to the edge of the plank that the thin transparent scales of wood which formed the outer side of the holes appeared but little thicker than foolscap paper. Holes were then bored into the edge of the same plank with a half-inch auger of the new construction, the sides of the holes being, of course, only one-sixteenth of an inch in thickness. 2-inch augers on the old and new plans were then tried on a piece of hard cross-grained ash, with a view to determine the relative force required to work the two systems. The testimony of the carpenter, by whom the experiments were made, was quite conclusive; his opinion being that, with the old 2-inch auger, the labour was of too severe a character for a man to work with it all day, while with the new tools he considered the work would not be harder than the ordinary routine of a carpenter's shop. Into this piece of ash 2-inch holes were bored in every direction and at every possible angle with the grain of the wood, without the necessity apparently of any extra exertion, or without the perfect character of the hole being in the slightest affected. Into a sound piece of white pine timber a 2-inch auger hole was then bored with one hand, with apparently more ease than the old style of auger could be used with two. * * * Although this discovery has only been before the public of the United States some fifteen or sixteen months, the new tools have already nearly superseded all others. Though manufactured by machinery, the demand, we are informed, is far greater than the supply."

SPECIAL MUSEUMS FOR THE WORKING CLASSES.

PRESENTATION OF THEIR ORIGINATOR, MR. T. TWINING, JUN., TO THE EMPEROR AND EMPRESS OF THE FRENCH.

At page 514 of our last volume (No. 1660) we directed the attention of our readers to the efforts that had been made, in connection with the Society of Arts, to establish public museums, the special object of which should be the improvement of the dwellings of the working classes. Although the original wishes of Napoleon III. respecting the promotion of this object could not be fully carried out, his plans have been so far realized that a *Galerie de l'Economie Domestique* has been formed in the Paris *Exposition* under his auspices. The *Moniteur* of November 4th speaks of it with great favour, characterizing it as one of the most fruitful results of the Exposition of 1855, and as the commencement of a philanthropic work which is of interest to all classes of society. Our philanthropic countryman, Mr. Twining, to whom belongs the undivided merit of introducing this important movement, has received the honour of a special presentation by His Imperial Highness Prince Napoleon to the Emperor and Empress of the French. During the visit, which lasted more than an hour, the Emperor congratulated Mr. Twining on the value and success of his suggestion, and the Empress expressed her warm approval of the exposition in the following terms:—"*Cette exposition est très-intéressante; c'est une bonne et utile création; j'espère qu'elle deviendra permanente, je le désire beaucoup.*"

Vis: A Treatise on the Predominative Influence of the Sunbeam through Creation, not only in the Production, directly or indirectly, of all Terrestrial Phenomena, but as the Sole Agent in occasioning and sustaining the movements of Heavenly Bodies. By Edward Brailsford Bright. London: John Weale, High Holborn. Liverpool: George Philipson. 1855.

Nearly ten years ago the discovery of the planet Neptune, not, as had hitherto been the case, by chance observation, but by deliberate search, in consequence of simultaneous but independent predictions, founded on calculation, by M. Leverrier, in France, and by Mr. Adams, in England, that such a planet was then to be looked for in a cer-

tain region of the heavens, was considered in the philosophical world as putting the coping-stone on the grand edifice of Inductive Philosophy applied to the phenomena of the heavens, first commenced by Newton, and elaborated by the subsequent efforts of Laplace, Pontecoulant, the Herschels, Airy, and others, who had wrought in this department of science. Accordingly Leverrier and Adams were men whom not only the savans of the civilized world, but sovereigns and princes thenceforth delighted to honour, and the Newtonian Philosophy was conceived to have achieved a triumph which removed it far above the reach of any hostile attack.

It would appear, however, that among a certain class of minds—and those too by no means uninstructed—the system of the universe, as explained by Newton, has been ever since that period falling into discredit; until at length it has been thought that the time has arrived when a new theory may remove Newton's from its pedestal and take its place.

This is undoubtedly a natural consequence of that independence and originality of thought which true philosophy, so far from checking, delights to encourage and to foster. Science does not ask for a parcel of school-boys, who are content to remain in leading-strings all their lives, and will sacrifice all independent thought to veneration for an illustrious name — but she rather delights in worshippers who are ever ready to enlarge the limits of her temple, and, if need be, even to lay over again the very foundations on which it is built. Such works, therefore, as that which we propose to submit to an impartial and discriminating examination, we are by no means disposed to treat with ridicule or contempt, *because* it professedly opposes the received astronomical theories. On the contrary, whatever be the fate which the theory of *Vis*, in place of gravitation, may meet with, we cannot but think that the efforts of Mr. Bright will be attended with considerable good. It is well occasionally to look upon not only the bright side of a system, however bright that may be, but also on the darker side which presents acknowledged blots and imperfections. The true philosopher will thus obtain an opportunity of reflecting how far the failing cases arise from an original imperfection of the system itself, or from an imperfection of the medium through which he views it: whether, in short, the explanation of cosmical phenomena requires the substitution of an entirely new theory for the present; or whether we must attribute the blots to the necessary deficiencies of our knowledge, and to our failure in hitherto grasping some *co-ordinate* theory not antagonistic to that received, but which by taking into consideration the other circumstances, may be properly called *supplemental* to it. We propose, then, to inquire whether the doctrine of *Vis*, as proposed by Mr. Bright, is entitled to supersede the doctrine of gravitation, as propounded by Newton and his followers. And here we must at the onset, once for all, give Mr. Bright the credit of having brought much research to bear upon this important question. He seems carefully and deliberately to have reviewed all that has been written (at least in a popular sense) by the most celebrated philosophers who have attempted to describe the phenomena of the heavens. No blot or imperfection in the explanations founded on the Newtonian Theory seems to have escaped him; and he certainly has not attempted to evade the application of his own theory to every class of cosmical phenomena.

We cannot, however, compliment him so highly on the logical exactness of his arguments in a mathematical point of view, whether those by which he assails the received philosophy, or those by which he seeks to establish his own. In fact, we believe that there are strong indications throughout the work that Mr. Bright is incompetent to deal with the mathematical investigation of the whole subject. His deficiency of mathematical knowledge taints the whole current of his observations throughout the book, and especially, we think, leads to serious misapprehensions on his part of Newton's doctrines. Vague statements which are employed by popular writers as mere illustrations adapted to convey to the non-mathematical reader such an idea as he is capable of forming of the causes of cosmical phenomena, Mr. Bright assumes as rigid expositions of the Newtonian philosophy. This is, doubtless, a necessary consequence of any attempt to master the details of the theory of universal gravitation, without a competent acquaintance with mathematical science. However successful some of our popular writers have been in bringing many of the problems of this class within the grasp of the ordinary reader, we do not believe any one but a mathematician can ever acquire an adequate

idea, we will not say of the simplicity and beauty of the Newtonian philosophy, but of the details of that philosophy itself. This will appear as we proceed. We shall follow briefly Mr. Bright's own arrangement, and first review those cases of which the theory of gravitation seems to afford an imperfect explanation, and then examine the theory of *vis*, which Mr. Bright proposes to substitute for it.

The description which our author gives of Sir Isaac Newton's statement of his elementary laws, although in accordance with popular explanations, is not fair in a scientific point of view. He says, "Sir Isaac Newton, in the work referred to (the 'Principia'), enunciates certain primary and fundamental laws, applied to govern all bodies in the universe, though acting in *continual antagonism to one another;* each in its turn *assumes to successively* preponderate over the other during the revolution of the planetary and other bodies of our system around the sun as a common centre" (page 10); and, again, "That there is a *centrifugal tendency*, arising from the projectile force, leading bodies to follow a straight course, which continually urges the planets to fly off from the circular paths they follow in completing their orbits, and that the centripetal influence (gravitation) and centrifugal so counterbalance each other, that the planetary bodies in their motion are compelled to assume a mean of direction resulting in their defined and unvarying annual course around the sun as the central gravitating point of the system."

To describe, on the Newtonian philosophy, the motion of the heavenly bodies as the result of two *antagonistic forces*, successively preponderating over each other, one *centrifugal* and the other centripetal, is by no means to describe it truly.

Strictly speaking, there is but *one force*, viz., the centripetal force. If a body be in motion in a direction oblique to the action of the force—no matter how that motion was originally acquired—then the combination of the two *motions*, the one already impressed (no matter how) on the body, and the other arising from the action of the force, will result in the description of a conic section by the body round the centre. This is the more correct statement of Newton's theory, and is rigidly demonstrable on the simple supposition of the existence of such a central force.

The term "*centrifugal force*" is one of the most unfortunate that ever was invented, and tends only to produce a confusion of ideas, from which the non-mathematical inquirer finds it extremely difficult to extricate his mind.

The natural presumption is, that centrifugal force is a *force* in the same sense as centripetal force, and to be treated on the same principles. Nothing is, however, less like the truth than this. If a body move in a circular orbit round a centre of force, there is a necessary relation existing between the velocity of the body, the magnitude of the force and the radius of the circular orbit; so that if F be the centripetal force, R the radius of the orbit, and v the velocity, $F = \frac{v^2}{R}$.

If there were no attraction, the body would proceed uniformly in a straight line with the velocity, v; hence, since in the circular orbit the distance of the body from the centre does not vary, this amount of force is a measure of that which keeps it always at the same distance from the centre; or, in other words, which just deflects it from the tangent: and $\frac{v^2}{R}$ applied in an opposite direction is supposed to measure the *tendency* of the body to move in a straight line. But this is a mere *façon de parler*. To suppose that a body has a *tendency* to move in a straight line, which exhibits itself in the form of a force, is simply an erroneous idea. For this reason mathematicians avoid the use of this expression as much as possible; and never employ it, except in those cases in which, in the application of D'Alembert's principle, it gives a ready means of expressing forces equal and opposite to the effective moving forces on particles.

It is a tendency of the human mind, implanted in it by nature—in other words, by the inspiration of God Himself—to speculate on the condition of our own and other worlds previously to their conforming to the circumstances in which they are now found, and on the means by which they were launched upon their present paths. But when it is said that the bodies of our system were *projected* with certain velocities, and in certain directions, all that is to be understood by this mode of speech is, that their *motion is the same as if they had been so projected.* It is a matter which concerns us comparatively little *how* the solar system came into being: nor did Sir Isaac Newton trouble himself with speculations of this kind, which can never be other than vague and unsatisfactory. The problem which presented itself to his mind was this—how to account rationally for the actual orbits of the planetary bodies. Take the case of any particular one of these—the earth, for instance; and take it at any point of its orbit. It is there subject to these conditions—it is moving with a certain definite velocity in a given direction (that of the tangent to the

orbit at the point), and subject to the action of the centripetal force. Now it makes no difference whatever *how* that velocity has been originally acquired. It is, therefore, under exactly the same circumstances as a body would be if *projected* at that point in the same direction and with the same velocity. The calculated orbit described under such circumstances agrees exactly with the observed orbit. We can form a distinct idea of such a projection of bodies; and that is all that is meant by Newton's Projectile Theory, of which so much has been said of late. But we do not limit in any way the operations of the Almighty, nor do we say absolutely that the heavenly bodies must have been projected in this particular way, and no other; we are content with describing their motions as identical with those *they would have had if so projected.*

We should not have said so much on this part of the subject were it not that it is manifest that to many minds the idea of an antagonism of forces (which we have shown not to exist), seems to be a fatal objection to the theory of gravitation.

Sir Isaac Newton never presumed to define the nature of this centripetal force further than that it is resident in all bodies, and that its intensity varies as the inverse square of the distance. *How* this force operates, he distinctly and philosophically left (as it must for the present still remain) *undetermined.* It is not in accordance with the facts of the case to describe his theory as *corpuscular* in the sense in which his theory of light was corpuscular, nor as mechanical in any other sense than this—that the centripetal force being a *real force* of attraction, through whatever medium that attraction acts, must, like any other force, conform to the laws which are established with regard to the action of forces in general which are the proper objects of investigation in *mechanical science.*

A second objection which Mr. Bright raises, is founded on the supposed vacuity of space in which the orbits of the planets are described; while there is reason to believe that "space is not void, and that there exists a definite resisting medium in the space through which the heavenly bodies pursue their course."*

To this we assent; but we cannot agree with the author that this must, in the course of "the *millions of years* during which the earth has existed in its present aggregation,† have resulted in an approach of all the bodies in the system to the sun."

This *ether,* which forms the medium for the transmission of light, is, to all intents and purposes, *imponderable.* The resistance of all media with which we have an acquaintance is in a direct ratio to their density; and to the density of this luminiferous ether it is out of our power to ascribe any value, on account of its extreme tenuity. Comets themselves are composed of matter of far less tenuity than the lightest gas on the earth's surface; and they move sometimes with very much higher velocities than any of the planets: consequently this ether may have a density *comparable* to that of a comet, although it bears no ratio to the density of the earth and planets; and, on the supposition that the resistance varies directly as the density of the medium and the *square* of the velocity with which a body passes through it, we can very readily understand how the ether may retard by so much as two days the orbit of a comet, though that orbit be not of more than four years period; while its effect upon the motion of the heavy planets is absolutely inappreciable. Something analogous to this we may observe at the earth's surface, when a stone or any other heavy body is thrown up into the air: the attraction of the earth on the stone and of the stone on the earth is *mutual;* but while the effect of this attraction on the stone is very perceptible, its effect on the earth is absolutely inappreciable, and would remain so however frequently the throwing up of the stone were repeated.

We cannot see any force in the objection "that an adoption of the hypothesis of a projectile force in conjunction with that of gravitation, in a measure would necessitate the formation of all the bodies of the solar system, the sun included, at the same moment of time."—Page 23.

This necessity is by no means demonstrable. Still less force is there in the objection that it would not "be possible, upon the application of these laws, for the planetary bodies to have been created at a greater distance from the sun than they at present occupy; *as the projectile force, during their movement towards the present mean position they occupy with reference to the sun, would under such circumstances, so nearly coincide with the centripetal, that* BOTH *forces must have urged the planets to the central luminary.*"

The words we have italicised do not seem to us to furnish any sufficient reason for the previous statement. We know nothing of the conditions in which the heavenly bodies were placed before or at the time of their creation. We cannot see any advantage that would be gained by supposing that the planets were created in any other position than that they now occupy. We certainly see no reason for presuming to limit the Creator's power in this respect, or to *oblige* him to work in one way rather than another. This we do

* Page 17. † Page 19.

know, that supposing the conditions that held at the time of the creation of a planet, to have passed away, and the planet to have found itself moving obliquely to the line joining its centre with that of the centre of force, it would according to the theory of gravitation describe the orbit it does describe and no other.

These conditions, we are told, "limit far too closely the sequence of creation." We conceive that they place no limit whatever on the operations of Omnipotent will, nor do we acknowledge any thing in the record of scripture antagonistic to the supposition of a simultaneous creation of all the planets, even did Newton's Philosophy *necessitate* this, which it does not. We might rather argue the contrary (though we do not base any of our philosophical ideas of the cosmogony on such a record as that of Moses, which had no reference to science whatever) and might maintain that as Moses says simply of all the heavenly bodies, "He made the stars also," that they *were* all created at one and the same time.

This, and the objection that precedes it on the 22nd page, namely, that the Newtonian doctrine "has a tendency to afford support to the Deistic theory of transcendance, which supposes that the qualities of matter having been bestowed upon the earth by its Maker, all motion and all phenomena are left to follow out their natural sequence in accordance with the impulse which was thus assumed to be originally and momentarily communicated; whereas, 'it is probable that matter depends for its existence upon the *constant efficacy* of God's power and presence,'" we cannot think the author places much reliance upon.

What rational person can doubt but that however directly matter may be supposed to depend on the constant efficacy of the Creator, the Creator works according to fixed laws? Caprice and irregularity are arguments of an inferior intelligence. Whether then the law which governs the motion of the universe be represented by a mutual force of attraction, or by an interchange of a power called *Vis*, equally dependent on material conditions with gravitation, we cannot see how in either case, or in one more than another, support is given to the Deistic theory of transcendence. If, however, this objection does lie (which we deny) against the Newtonian theory, it lies equally against the theory by which Mr. Bright proposes to replace it.

Another objection of Mr. Bright's is founded on a misinterpretation of facts. He says it is "scarcely possible to assume the application of an initiative impulse to *sult in the coincidence as observed of all the ?or and minor axes of the planetary orbits of revolution*, and in the uniform rotation of the planets and the sun in the same direction." He adds, in a foot-note, his authority for the statement we have italicised; namely, "The orbits of all bodies that revolve about the sun, both planets and comets, *have a common focus* in which the sun is situated."—*Mechanism of the Heavens.*—Dr. Olmsted.

This authority by no means bears out the statement, which is moreover contrary to fact. Not only do the major and minor axes of the planetary orbits not coincide, but they are not even in the same plane, nor do the lines of intersection of the planes of the *orbits' motion*, in other words, the lines of nodes, coincide.

Another objection is found in the necessity for supposing the original impulse to have been communicated to the planets in a direction not passing through the centre, and that in different degrees, for all the various planets, in order to account for their rotations about their axes, which are made in different periods.

Now, it is just as natural and easy to conceive that an impulse should be communicated excentrically as centrically; nor is there any assignable reason why it should be made at one relative distance from the centre rather than another, or at any *one* definite distance at all.

It is neither rational, nor, we submit, very respectful to the great Creator to seek to confine his agency within any such limits. For aught we know, the conditions to which the planets were subjected on their first entry upon their present state were such as naturally to engender both the motions of translation and rotation, which seem to give such woful offence. A foot-note, by the author, on page 28, with reference to the same subject, is open to graver objections. He says, "Such an excentric distribution of the initiative impulse, from affecting the masses of the planets in a direction differing from their line of equilibrium, would, however, have a tendency to urge them forward in any direction rather than the straight line assumed by Newton."

No person who possessed a competent acquaintance with the theorems of mechanics would commit himself to so grave an error as this. When a body at rest is set in motion by a blow or impulse, the centre of gravity moves in a direction parallel to that in which the impulse is communicated, and with an amount of motion proportional to its intensity, and, of course, in a straight line; while the rotation is proportional directly to the moment of the impulse about the centre of gravity, and inversely to the moment of inertia of the body.

The secondary bodies of our system un-

[redacted]

doubtedly present a peculiarity with respect to their *rotation* which it is impossible to attribute to accident, and of which no satisfactory account has yet been given. This peculiarity is, that they turn upon their axes in periods equal to their respective sidereal revolutions about their primary. To account for this anomaly, we are driven to suppose either that just such an amount of angular motion was originally impressed on them (which certainly does appear highly improbable), or that there is some peculiarity in the physical relation in which they stand to their respective primaries.

To account for this phenomena in the case of the moon, Lagrange attributed to that satellite an ellipsoidal shape instead of a spheroidal; that is, he supposed, not only the polar axis to be the shortest, but the moon's equator itself to be an ellipse, having its major axis turned towards the earth. In this case, the attraction of the earth on this protuberant portion of the moon is supposed to be just sufficient to keep it always turning, so as to retain the extremity of the axis major pointing to the earth. A similar supposition would apply also to the satellites of Jupiter and Saturn. The objections urged by Mr. Bright against this view of the case are grounded chiefly on the inconsistency of supposing that while the rotation of the planets themselves is due entirely to the agency of some cause which operated previously to the time of their entering on their present course, the satellites should have their original motion so impressed that no *rotation* was produced at the same time.

That the motion of the satellites in their orbits round their respective primaries is in strict accordance with the theory of gravitation, is not denied. The satellites are, from their very nature, differently circumstanced from their primaries; and it is *very possible* that a difference of circumstances prevailed also at the time of their formation, which, could we become acquainted with it, would fully account for this peculiarity in their rotation.

The question is, Is the presumed objection to the Newtonian theory arising from this anomaly sufficient to counterbalance the evidence in its favour, arising from the fact that, at all events, the principal motion of the satellites is satisfactorily accounted for by it? In forming a judgment on this point, it must be borne in mind that any theory which might be adduced to account for their peculiar rotation would not, in the slightest degree, affect their orbital motion; or, in other words, would be *supplemental* only, not antagonistic, to the doctrine of universal gravitation.

Another circumstance *unaccounted* for by, but not *opposed to*, the theory of gravitation is, that the sun and all his attendants rotate on their axes in *one* direction; viz., from west to east, which is also the direction of the motion of the latter in their orbits round the sun.

A last great objection to the Newtonian theory urged by Mr. Bright is founded on a peculiarity in the motion of *comets*. It is this, that exactly contrary to what we should have expected, "the tails of comets are always turned away from the sun, so that their line of prolongation passes through its centre."

Still even here the theory of gravitation accounts for the *principal* motion, the return of comets after very long periods of absence having been predicted in accordance with calculations made on this theory, and having taken place accordingly. The phenomena connected with the tails have been accounted for on the supposition of a great dilatation of the vapours of which the comets are mainly composed on their approaching to the sun, and these vapours so dilated being *repelled* by a force directed from the sun; this latter force being coexistent with, but independent of the *main* force of attraction by which the motion of the comet itself is regulated. For further information on this subject the reader is referred to Herschel's Astronomy, pp. 351—353.

Now, there is nothing whatever inconsistent in the supposition of the coexistence of these *two* forces of an entirely different character, and both having the sun for their centre. Analogous cases are presented to our notice by nature every day. For instance, we see gases acting on each other, and their own particles affected by strong repulsive powers, and yet all acted on by the force of gravity, so that the same mass, which at one time has a definite weight at all times has the same weight. A pound of water converted into steam by the action of heat, still weighs a pound, although the properties of steam and water are entirely different. There is therefore nothing "irreconcilable with the law of gravitation" in the supposition that the near approach to the sun of a comet should result in the vaporizing and dilating of a considerable portion of its mass by the heat of the sun's rays, and in the evocation of other forces of a kindred nature with which we have no acquaintance at the surface of our earth, while all the time the attractive power of the sun, according to the laws of gravitation, remains unchanged and in full force.

On the whole, then, considering all the objections which Mr. Bright has urged against the Newtonian Theory, we think he has failed in making out his case—that there is so *violent* an *improbability* against it, *per se*, that a new theory in lieu is imperatively

demanded. On the contrary, we have seen that in all cases it is rather some circumstance attending the primeval condition of the heavenly bodies, or something calling for the application of a *supplemental* theory, rather than the broad, grand feature of Newton's philosophy, viz., the accounting for orbital motions by the action of a centripetal force, against which his objections are launched.

And, on the other hand, no account whatever has been taken of all those minute calculations of the perturbations of the orbits of the heavenly bodies, arising from their mutual attractions, according to the theory of gravitation, and the beautiful harmony of the observed places of these bodies with those thus calculated, which afford to those who are capable of appreciating them and the wonderful analysis on which they depend, the most convincing proofs of the general truth of this theory—that is, that the motions of these bodies are explicable on the theory of all bodies in nature attracting one another with forces varying directly as their masses and inversely as the square of their relative distances, however we may suppose the initial motion to have been communicated.

The discovery of the planet Neptune, in consequence of calculations made simultaneously by M. Leverrier and Mr. Adams, founded on slight differences in the position of the planet Uranus from what it ought to have had, and which they attributed to the perturbations of an exterior planet, has been already alluded to as amongst the greatest marvels of science in this age. That it should have actually been detected by Dr. Galle, of the Royal Observatory of Berlin, on the 23rd of September, 1846, at a distance of only 52′ from the place assigned by M. Leverrier, and 2° 27′ from that assigned by Mr. Adams, affords a confirmation of the Newtonian theory of the motion of heavenly bodies, which, on reflection, will appear little short of demonstration. "Posterity," says Sir John Herschel, "will hardly credit that, with a full knowledge of all the circumstances attending this great discovery, of the calculations of Leverrier and Adams, of the communication of its predicted place to Dr. Galle, and of the new planet being actually found by him in that place, in the remarkable manner above commemorated, not only have doubts been expressed as to the validity of the calculations of those geometers, and the legitimacy of their conclusions, but these doubts have been carried so far as to lead the objectors to attribute the acknowledged fact of a planet previously unknown occupying that precise place in the heavens at that precise time to sheer *accident!*"

Mr. Bright undoubtedly writes as an advocate, and presses into his service, as we have seen, objections against the theory of gravitation of all kinds, *moral and religious*, as well as *physical*. We could, therefore, hardly expect that he would present his readers with the obverse of the medal—the facts and arguments which make for the Newtonian Theory, with a force little short of demonstration. We very much question, in fact, whether Mr. Bright's mathematical attainments are such as to enable him to appreciate the full force of these considerations. But we should be ill discharging the duty we owe to our readers, if, in endeavouring to place the evidence for and against the theory of gravitation fairly before them, that they may be in a position to form a correct judgment, we entirely omitted all mention of this, the most striking and convincing testimony in its favour. Our limits do not, unfortunately, permit us to do more than allude thus briefly to it. For further information, which we promise them they will find replete with interest, we refer them to the 14th Chapter of Sir John Herschel's Astronomy. But notwithstanding the almost overwhelming strength of the evidence in favour of the Newtonian theory, and the little weight which we have shown is to be attached to the objections urged against it in this work, we should not be correct in at once condemning a theory which seeks to supplant it, especially as it professes not only adequately to account for all that the theory of gravitation so satisfactorily accounts for, but also all those peculiarities of some of the heavenly bodies as regards rotation and other phenomena above described, of which as yet no satisfactory account has been given. Such Mr. Bright's theory of *Vis* claims to be. We will proceed briefly to examine its claims. In executing this portion of our task, we fear that we may unintentionally fail in doing our author justice. His statements are altogether of so *general* a character, never descending to the *experimentum crucis* of mathematical investigation, that our remarks must necessarily partake in a great measure of the same character. In fact, we find it very difficult to look at the subject at all from the same point of view as Mr. Bright; we therefore again bear our record to the great research shown by him in this essay, and to the ingenuity with which he puts forward his own views of the solar system, with all the peculiarities which the several bodies exhibit. At the same time we must remark, that the vague form which his observations take, even allowing them to be correct, and the total absence of anything like accurate and rigid investigation, could not, under any circumstances,

amount to anything more than rendering it *probable that his might* be the true account of the forces which regulate the motions of the heavenly bodies. Whether he has succeeded in making out his case, even so far, will appear as we proceed.

(*To be continued.*)

Hand-book of Natural Philosophy. By DIONYSIUS LARDNER, D.C.L., formerly Professor, &c. *Mechanics.*—With three hundred and fifty-seven Illustrations. London: Walton and Maberly, Upper Gower-street, and Ivy-lane, Paternoster-row. London, 1855.

THIS is the first volume of a new and greatly enlarged Edition of Dr. Lardner's Hand-book, which has already received more than one commendatory notice in our pages. Dr. Lardner is a writer who, while he does very much indeed towards popularizing and extending a knowledge of science, seldom or never departs from the precision and accuracy which are so essential to its proper exposition.

The volume before us, with others which are to follow, are intended for those who desire to attain an accurate knowledge of physical science without first studying mathematics sufficiently to enter upon the profound investigations necessary to a thorough understanding of it. Hence the explanations are, as they profess to be, studiously popular, and are everywhere accompanied by diversified elucidations and examples, derived from common objects, wherein scientific principles are applied to the purposes of practical life.

Of this volume on "Mechanics" we have only space to say, that it is well arranged, written with philosophical accuracy, and beautifully printed and illustrated; and that it forms such an exact and elaborate treatise on that subject as can in no other form be purchased for five shillings. The style in which it is written is of so attractive a character, that the book may be studied with as much pleasure as profit.

ALUMINIUM.

To the Editor of the Mechanics' Magazine.

SIR,—I observe, with great satisfaction, that the controversy which has been carried on so long is now to be concluded, although I have no doubt it has been very interesting to many of your readers.

Having seen at the Paris *Exposition* some splendid specimens of *aluminium*, as well as a watch and a balance constructed of this metal, I am anxious to draw the attention of practical men to the importance of the object that I have in view, viz., the obtaining the metal in considerable quantity, and at a moderate price.

The following observations from the correspondence of M. Jerome Nicklès, of Paris, published in the American Journal of Science, may be of some use in the investigation.

At the chemical works of Javel it has been proved that *sodium*, which is superior in energy to *potassium*, may be prepared by Deville's process. Numerous trials have also shown that it may be kept in fusion in contact with the air without inflaming; and that it may be run out of the apparatus which furnishes it. A metal like *sodium* brought within the reach of science and the arts, must soon come into extensive use. M. Dumas has remarked on the fact, that the study of aluminium had introduced a new process into the arts for the reduction of ores—that from the chloride of the metal; and that this method might be important for other metals not yet brought into use. He also mentions the sonorousness of aluminium, a quality in which it compares with the best bronze, having a quality of tone not hitherto observed in any metal in the pure state, which is another peculiarity of this curious metal. He stated in reply to inquiries, that the materials employed in making one kilogram of aluminium, viz., the ammoniacal alum, the alumina which is derived from it, chlorine, carbon, carbonate of soda, chalk, are all of low price. The whole cost is reduced to thirty-two francs, which is very small when we consider that the expense of sodium, when the experiments in aluminium were begun, was 1,000 francs per kilogram, which alone would make the price of aluminium 3,000 francs. M. Balard, who is familiar with industrial applications, stated that he had gone through the steps of the process at Javel, and was satisfied that the cost of the sodium could be still further reduced when prepared on a larger scale, which I hope some of your readers will speedily attempt.

The chloride of aluminium is prepared at the Javel works by the reaction of chlorine on a mixture of alumina and coal tar previously calcined, which is easily effected in a gas retort. The condensation of the chloride is produced in a chamber of masonry, lined with earthenware. The chloride contains a little iron, which is removed entirely in melting it for aluminium, by making its vapour pass over points of iron heated to 400° C. The sesquichloride of iron, as volatile as the chloride of aluminium, is changed, through contact with iron, into the protochloride, which is relatively very

fixed. The vapour of the chloride of aluminium, in leaving the apparatus, affords colourless transparent crystals.

In preparing the *sodium*, there are used—

Dry carbonate of soda	1,000	parts.
Chalk	150	„
Dry coal of Charleroi	450	„

which are pulverized, mixed with care, and calcined to a red heat in a pot.

Wheatstone long since showed that aluminium was as strongly negative as platinum. M. Hulot, director of the galvanizing and coinage of Paris, has tried the use of the impure aluminium in a galvano-plastic battery. He found that a couple of aluminium and zinc, the latter amalgamated some considerable time previously, when charged with water, acidulated with $\frac{1}{20}$th of sulphuric acid at 66° C., has afforded during the first hour a current at least equal to that from a couple of platinum and zinc, excited to the same degree. After six hours the current had lost one-fifth of its original force. The battery was not completely polarized at the end of twenty-four hours, and the current still preserved one-fourth of its force. To restore its electro-negative character to the aluminium, it was necessary only to immerse it an instant in nitric acid, and then wash it.

According to MM. Tissiers, pure aluminium is easily distinguished from the impure, by its greater whiteness, its indistinct traces of crystalization, and rarely one or two well-defined hexagons on the surface of the ingots; while the impure has a bluish tint, like zinc, and if the whole is not crystalline, the upper surface is much more so than in pure aluminium, and the form is also quite different. According to the experience of one of the most extensive galvanizing establishments of Paris, the metal works as well as silver.

It may be whitened easily by dipping the piece in a concentrated solution of soda or potash, and passing it then into nitric acid. This acid acts differently according as it is itself pure or mixed with chlor-hydric acid, and according as the aluminium is pure or not.

Aluminium is most easily soldered when alloys are used containing aluminium. The alloys most convenient are those with silver, zinc or tin; the point of fusion being below that of aluminium; the soldering may be done by means of a simple spirit lamp, and without any previous cleaning.

I hope the above observations may not only prove interesting, but that some of your *practical* readers may seriously set to work, and succeed in producing on a large scale a metal which promises to be of so much use in the arts. I am, Sir, yours, &c.,

C. M. W.

November 3, 1855.

EXPANSIVE MARINE ENGINES.

To the Editor of the Mechanics' Magazine.

Sir,—Your last week's number contained a letter from Mr. Mushet, in which he assumes that I am unwilling or unable to meet what he calls his challenge. The fact is, that I wrote a letter in reply to the one in which he recommended me to examine some numbers of your Magazine, in vols. xlvii. and xlviii. This letter, by some mistake I presume, was not published;* and as it was of little consequence, I did not again write. In that letter I merely drew Mr. Mushet's attention to the real questions between us, desiring him to confine the discussion to them alone, and promised to examine the plans to which he had referred. I have had no opportunity of doing so until a few days since; and, indeed, have now only glanced through Mr. Craddock's patents. The particular points claimed by Mr. Craddock had escaped my memory; but on referring to his patent of 1846, I find the arrangements so totally different from mine, and the objects sought by him so different, that I cannot conceive how Mr. Mushet could place our plans in competition. I am most willing to admit the ingenuity and completeness of Mr. Craddock's plans, and the ability he showed in carrying them out, especially so long ago, when the subject was comparatively new; but this is all nothing to the purpose.

The main feature of the plans, as far as the engines are concerned, was inclining the cylinders with respect to each other, and so getting the double cylinder engine to work in the ordinary way. A better plan, however, I think, is shown where the high and low pressure engines are set to work cranks at right angles. With respect to the boilers and condensers, although interesting subjects, I shall say nothing, as it is only introducing matter about which I am not discussing.

The engines of Mr. Craddock are not shown as applied to a screw vessel; and if they were shown, it would not alter the question, as they would evidently not take up less room than an ordinary single cylinder engine.

The breadth across ships taken up by either of the plans applied to a screw would be made up of the length of the cylinder and the connecting rod, with clearances, as in the ordinary case. My engine is designed as a short engine, and therefore cannot be compared with Mr. Craddock's in any other way than I compare it with nearly every engine in use. In other words, I profess to have done nothing more than I have

* This letter did not reach us.—Ed. M. M.

done, which is, to combine a trunk engine with a double expansive engine, and arrange it for working a screw. If Mr. Mushet thinks that I profess to have made any great discovery in using high pressure steam, or in working it more economically than could be done in a single cylinder, with cut off gear, he is mistaken. It seems to me that Mr. Mushet is disposed to say anything about anything, in order to draw others out; and if this be the case, it is only waste of time to occupy your pages with letters. I should very well like to discuss the subject of expansion in marine engines, which I consider a most important one; but at present I do not think the materials exist for any useful discussion. I am doing what I can in collecting matter, and am daily discussing the subject with engineers, although at present little is said that would be worth while to print, as the most of it is mere opinion. When I really get together anything useful, I will gladly communicate it to your readers.

I am, Sir, yours, &c.,
E. E. ALLEN.

376, Strand, Nov. 7th, 1855.

DUNDAS'S MALLEABLE IRON ORDNANCE.

To the Editor of the Mechanics' Magazine.

SIR,—Several notices having lately appeared in your Journal relative to "Dundas's Malleable Iron Ordnance," its novelty, &c., will you permit me a few remarks thereon. In July, 1854, I submitted to the Admiralty plans for guns of *precisely similar construction* to those in question, but large enough to discharge percussion shells of *one and a half tons weight*, and adapted to bomb-proof vessels—since called "floating batteries." My plans were rejected with the remark "*not capable of adaptation.*"

A few months later the *Admiralty* adopt the bomb-proof vessel—the *Ordnance* entertain the construction of the gun. What an illustration of official order and system! Can there be any surprise at war matters being *muddled?*

I am confident, that had my *original* plans been carried out at the time, all the Russian navy, forts, arsenals, &c., Black, White, Baltic, or other, might long since have been captured and destroyed, with less than one-hundredth part the cost, and one-thousandth part the loss—wanton, criminal loss—of English blood. Dundas is right when he says that, this in question, is the only true method of constructing ordnance of large size. Our ancesters, nay, even Turks and Chinese, centuries ago saw this; and we can only admire the energy and enterprise which endeavoured to realize their conceptions with their then mechanical means. Had we but a war executive actuated by similar foresight and intelligence, and as able to utilize the mechanical and scientific capabilities of the present age! I do not mean to eulogise the discrimination of the *Ordnance* at the expense of the *Admiralty* Board; far from this, I have received the same stereotyped reply, "not capable," &c., in reference to a *light field piece*, of annihilating powers,—also, like the "*hooped segmental guns*," a realization of century-old ideas, by modern machinery. But I trespass too far. Would that our war executive would deign to learn of their forefathers, and that Mr. Dundas might have more success with them than I had.

I am, Sir, yours, &c.
J. HYDE PIDCOCK.

Linslade, November 1, 1855.

THE PROJECTILE AND ASTRONOMICAL CONTROVERSY.*

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Mushet, who, I presume, considers himself the *ne plus ultra* of "a common sense" philosopher, as he certainly can lay no claim to the title of a mathematician, takes uncommon pains to show how "infinitesimally" minute are his qualifications to deal with the questions which have been raised between Mr. Hopkins and his school on one hand, and mathematicians on the other.

I certainly should have thought that he would have best consulted his own reputation by abstaining from coming forward again so soon after his naïve confession that he had been taking part in a controversy about questions of which he knows nothing. His letter in your last number will spare him the trouble of making the humiliating confession again, as it leaves no room for mistake on this point.

Even Mr. Hopkins allows, that when a railway-train moves uniformly, the horse-power of the engine is equal to the work done by the friction and the atmospheric resistance, and I *proved* that this condition also implies that to which Mr. Mushet gives so stout a denial, and which he says with his usual boldness, "must result in the train uniformly standing still."

There is no village schoolmaster who has worked Tate's *Examples in Mechanics*, and passed for a certificate at the Privy Council Office, who could not teach him better. I presume the string of childish questions which he proposes with regard "to the innumerable interesting particulars arising out of the inquiry," as to motion of a projected body, are intended as a choice specimen of the "insinuations of malicious

* The contents of this letter sufficiently account for its publication.—ED. M. M.

wit," about which he is so eloquent. If he propounds them in sober seriousness, he shows most incontestably his profound ignorance of the theory which he presumes to call in question: if he means them as a lively exhibition of "malicious wit," I for one am willing to leave the field vacant to him, for the display of his uncouth movements, which remind me of nothing so much as the saltatory motions of a bear, or of the goat-footed attendants on Bacchus. If such be the nature of "the insinuations of malicious wit, that there is an inherent antagonism between philosophy and common sense," mathematicians may make themselves quite easy. I leave him on the horns of this dilemma. In either case he is not worth the waste of time and paper which a *reply* to his *facetious* (?) sally would consume, and which would be simply an insult to the common sense of your readers.

Mr. Mushet wishes to be esteemed a profound disciple of the school of Bacon, and talks of his *idolæ* as if he had a deep acquaintance with the immortal works of that illustrious philosopher, betraying, however, even here, his ignorance by coining the word "idolæ," which Bacon was far too learned to use, and which, for all I know, makes its first appearance on any stage in Mr. Mushet's last week's letter.*

I will agree with you, Sir, that as one party so pertinaciously clings to the poor subterfuge of meeting argument and proof with declamation, bold denial, and "malicious wit," it is quite time to bring this so-called controversy (if that can be called a controversy in which the argument is *all* on one side) to a close. As I have, by the quiet concession of those who took up this question before me, taken the most prominent part in this controversy, on the side of established truth, you will, perhaps, permit me (by publishing this letter) once more to appear before your readers to make my farewell bow, and while I assure them that nothing will induce me to take up the cudgels again in this quarrel, I hope that the discussion, turning, as it has done, on the very foundations of mechanical truth, has not been entirely without profit.

I am, Sir, yours, &c., W.

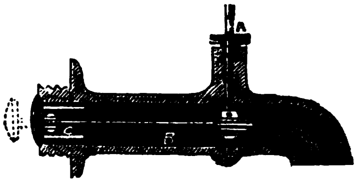
London, November 6, 1855.

AN IMPROVED TAP.

To the Editor of the Mechanics' Magazine.

SIR,—It has always struck me that a taper plug was the worst principle upon which taps could be constructed. Every one possessed of a boiler must have experienced the inconvenience arising from leakage, and the difficulty of regrinding a tap of that construction.

Enclosed, I send you a rough sketch of a tap, which seems to me well-adapted to meet the requirements of such an article. A is worked by a key or lever in the usual way; only, instead of being taper, it is



cylindrical, and has an excentric at the bottom on which a collar is fitted. Into this collar a spindle, B, is screwed; this latter, moving in a guide at C, carries a disc which is coated with a suitable material.

The action of the tap is exceedingly simple, and the working parts can be easily got at and renewed if necessary. The seat of the disc may be formed in the female screw, which connects the tap to the boiler.

Other modifications of the principle are so obvious that I need not occupy your space further in alluding to them.

I am, Sir, yours, &c.
GULIEL.

* Although in Mr. Mushet's MS. the single vowel is written obscurely, there is no reason to believe that the diphthong was intended. The correction should have been made by the printer.—*ED. M. M.*

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BUNNING, THEOPHILUS WOOD, of Newcastle-upon-Tyne, engineer. *Improvements in steam engines.* Patent dated March 30, 1855. (No. 716.)

This invention consists of an arrangement of trunk engines in which the steam from the boiler is only admitted under the piston to perform the up-stroke, while it is made to enter through a slide of a particular construction into the upper part of the cylinder, there to work expansively and perform the down-stroke.

WHITLEY, CHARLES, of Manchester, Lancaster, self-acting tool-maker. *Improvements in machinery or apparatus for drilling.* Patent dated March 31, 1855. (No. 718.)

Claim.—So arranging, combining, and working drilling apparatus that the cutters may have simultaneous motion given to them, to cut in directions towards or from a common centre, or towards or from lines crossing each other.

SURGEY, JOHN BAILEY, of Lidlington-place, St. Pancras, Middlesex. *Improvements*

in instruments for threading needles. Patent dated March 31, 1855. (No. 719.)

Claim. — Constructing instruments for threading needles with a divided guide or funnel for the passage of the thread, which divided guide or funnel is capable of being closed during the operation of threading the needle, and readily opened to allow of the escape of the thread.

Corbitt, William, of Elm-tree Bank, Rotherham, York, stove-grate manufacturer. *Improvements in warming and ventilating apartments, parts of which improvements are applicable to the prevention of smoky chimneys.* Patent dated March 31, 1855. (No. 720.)

Behind the fire-brick back and sides of an ordinary grate, the inventor forms an air-heating chamber of fire-brick or iron, placed in communication with the atmosphere by a suitable cold-air passage. The admission of air into this chamber is regulated by means of valves.

Hardman, Robert, of Bolton-le-Moors, Lancaster, mechanic. *Certain improvements in looms for weaving.* Patent dated March 31, 1855. (No. 721.)

This invention consists of certain improved combinations of parts for raising and lowering the drop-box containing the shuttles, so that any of the shuttles may be brought in a line with the picker when required.

Newton, William Edward, of Chancery-lane, Middlesex, civil engineer. *An improved mode of constructing centrebits.* (A communication.) Patent dated March 31, 1855. (No. 722.)

This invention relates to a novel construction of boring-bit, the object being to bore with one tool smooth holes of various diameters. For this purpose the cutters which fit into guides made to receive them in the head of the bit, are caused to slide simultaneously in opposite directions, either by means of a pinion gearing into racks formed on the cutters, or by a turn-plate provided with pins which take into slots formed in the cutters, or by other analogous means.

Balmain, William Henry, of St. Helen's, Lancaster, manufacturing chemist. *Improved methods of, or processes for, recovering oxide of manganese after it has been used in the manufacture of chlorine.* Patent dated March 31, 1855. (No. 723.)

This invention consists in recovering the oxide of manganese "by carrying on the process in conjunction with the manufacture of muriate or hydrochlorate of ammonia from the ammoniacal water formed in making coal-gas."

Wilson, George Fergusson, and George Payne, of Belmont, Vauxhall. *An improvement in treating oils to obtain an elastic product.* Patent dated March 31, 1855. No. 724.)

This invention consists in subjecting castor and other oils of a mucilaginous character to the process of distillation at a high temperature, and at the same time excluding the atmospheric air therefrom.

Crampton, Thomas Russell, of the Adelphi, Middlesex. *Improvements in locomotive and other steam boiler furnaces.* (A communication.) Patent dated March 31, 1855. (No. 725.)

This invention consists in employing a series of flat bars arranged transversely in a furnace of a steam boiler, one bar below another, and somewhat forward of each other, thus producing a shelving grating with spaces for the passage of air horizontally between the bars. At the lower part of such series of shelving bars is a series of ordinary fire-bars, which receive the well-ignited fuel descending down the shelving bars, and which are so connected with an axis as to allow fire to be dropped upon them when desired.

Abbott, Elizabeth, and Matilda Abbott, of Horningsea, Cambridge, gentlewomen. *Improvements in stays.* Patent dated March 31, 1855. (No. 726.)

Claims.—1. An improved busk-fastening for stays which fasten in front, consisting of a busk provided with projecting studs with oblong heads, which pass through button-holes made either behind the opposite busk or in tabs attached to the stay. 2. Adjusting stays to the waist of the wearer by means of bands attached to the back of the stays which draw together or let out a regulating folding-piece in the back thereof.

Hedgcock, Thomas, of Cavendish-grove, Wandsworth-road, Surrey, master Royal Navy. *An improved quadrant for taking solar altitudes for latitude without aid of marine horizon, and for ascertaining the true longitude.* Patent dated March 31, 1855. (No. 727.)

The inventor describes an instrument in which glasses are so combined that in taking a solar altitude the sun in a detector glass is brought to the centre of a spirit level, when the observation is correct, one important use of the level being to test the correctness of the instrument in hazy weather.

Phillips, Frederick, of the Hall Farm, Downham, near Brandon, Suffolk, land-agent. *Improvements in machinery or apparatus for distributing manure, sowing or depositing seeds, and effecting the working and cultivation of land.* Patent dated April 2, 1855. (No. 729.)

The machine described by the inventor consists of a strong frame, mounted on wheels, to be drawn by a horse or otherwise. On the upper side of the frame is a seed and manure-box, and attached to the frame are levers, either of wood or metal, which work

freely on a joint at one end, and are drawn up or let down at pleasure by means of chains or other suitable apparatus worked by a crank windlass or lever. Attached to these levers are certain shoes or breasts, which, on being let down, work into the soil and form it into ridges, the seed and manure being delivered at the same time, &c.

TAYLOR, JOHN, of Spring-grove, Hounslow, Middlesex. *An improvement in the manufacture of covers for books.* Patent dated April 2, 1855. (No. 731.)

This invention consists in forming a cover for a book of two parts, each resembling an ordinary letter envelope. One of these parts is placed upon each of the flaps of the cover of the book, and their open flaps are joined together, by gum or otherwise, at the back.

CREWS, CHARLES, of Montague-terrace, Bow-road, and HENRY GEORGE GRAY, of St. James's-street, Middlesex. *Improvements in preparing and using deodorizing or disinfecting compounds.* Patent dated April 2, 1855. (No. 732.)

This invention consists in combining common salt, bromide of potassium, and iodide of potassium, or other compounds of bromine and iodine, with or without other matters, as one compound. For a second compound an acid salt is used. "These two compounds may," say the inventors, "when separate, be conveyed from place to place, or kept in store without losing their properties; but, on being combined, they give off combined vapours, which are highly useful for deodorizing and disinfecting purposes."

NEWALL, ROBERT STIRLING, of Gateshead-on-Tyne, wire-rope manufacturer. *An improvement in the standing rigging of ships and other vessels.* Patent dated April 2, 1855. (No. 733.)

Claim.—The manufacture of standing rigging, by employing wires laid or bent spirally around cores.

PEYTON, RICHARD, of the Bordesley-works, Birmingham. *Improvements in the manufacture of iron gates and fences.* Patent dated April 2, 1855. (No. 734.)

This invention consists in casting the ornamental portions of gates and fences in malleable cast iron, and rendering the same malleable (or in casting such parts in ordinary cast iron, and annealing the same), and in combining such ornamental castings with the parts of the wrought or cast iron frames of gates and fences by means of further metal castings.

FRIEND, GEORGE WILLIAM, of High Holborn, Middlesex, umbrella and parasol-manufacturer. *Improvements in umbrellas and parasols.* Patent dated April 2, 1855. (No. 735.)

This invention consists in coating the steel ribs of umbrellas and parasols with metals which damp will not oxidize.

LUND, WILLIAM, of Fleet-street, London, manufacturer, and WILLIAM EDWARD HIPKINS, foreman to William Lund. *Improvements in the manufacture of corkscrews.* Patent dated April 2, 1855. (No. 736.)

Claims.—1. With respect to those corkscrews, in which the screw is raised by means of a rack and pinion, constructing the shaft to which the screw is connected at one end and the handle at the other, with a series of concentric rings placed equi-distant, into which an ordinary pinion works, whereby no worm inside the shaft is required. 2. With respect to lever or nipper corkscrews, making a slot in the lever to enable it to adapt itself to the screw in order to raise the cork, and so constructing the screw that it may be used either independently of or in conjunction with the lever. 3. With respect to pocket corkscrews, certain means of fixing the screw or worm into the handle when in position for drawing a cork, without weakening any of the parts thereof; and in a means of fixing the worm inside the handle for the purpose of carrying the same in the pocket.

BOTTA, FRANÇOIS THEODORE, of Paris, brewer. *Improvements in the method of and apparatus for beer-brewing.* Patent dated April 3, 1855. (No. 737.)

Claims.—1. "A method of boiling and cooling the malt and worts by applying a more or less perfect vacuum, and taking advantage of the liquid obtained from the condensing of the aromatized vapours arising from preceding boiling operations." 2. An arrangement of apparatus, and its application to brewing operations, &c.

CHAPMAN, HENRY, of Kingsland, Middlesex. *An improved electro-mechanical apparatus for supplying and adjusting the electrodes used in the production of the electric light.* Patent dated April 3, 1855. (No. 739.)

Claims.—1. Constructing apparatus for supplying and adjusting one or both the electrodes used in the production of the electric light by means of a break-wheel and a break controlled by the current of electricity. 2. Certain peculiar combinations of parts forming the apparatus, and various modifications thereof.

PRIDEAUX, THOMAS, of Birmingham, Warwick, farmer and hotel keeper. *A new or improved plough for draining and other similar purposes.* Patent dated April 3, 1855. (No. 740.)

This invention consists in constructing a plough furnished with four vertical cutters or coulters, and one horizontal cutter or share.

JACKSON, PETER ROTHWELL, of Salford, Lancaster, engineer. *Improvements in machinery for making patterns and for moulding therefrom.* Patent dated April 3, 1855. (No. 741.)

A full description of this invention was given on pages 169, 196, of the current volume, Nos. 1672—3.

POWERS, HIRAM, of Florence, Tuscany, sculptor. *Forming perforations or throats to the cutting edges of files or rasps, for allowing the particles cut away to pass through, and to prevent the instrument from clogging or choking.* Patent dated April 3, 1855. (No. 742.)

This invention consists "in forming perforations or throats to the fin-feather or other cutting surfaces of rasps or files, for the purpose of enabling them to clear themselves of the material cut away by them, and to prevent their filling or choking, or allowing the particles to pass through said perforations or throats."

TOOTH, WILLIAM HENRY, of Pilgrim-street, Kennington-lane, Surrey, engineer. *Certain improvements in the construction of floating vessels, and in the machinery and steam signals connected therewith, and in the application thereof to other purposes.* Patent dated April 3, 1855. (No. 743.)

A description of this invention will be given hereafter.

GILL, WILLIAM EATHORNE, of Totnes, Devonshire, engineer, and HENRY BRINSLEY SHERIDAN, of Parson's-green, Middlesex, gentleman. *Treating fish for oil, and utilizing the products of such process.* Patent dated April 3, 1855. (No. 744.)

In carrying out this invention the fish is ground by being passed between rollers moved at different speeds, and then dried by being passed, by means of Archimedean screws, through five or six drying troughs until the solid matter is sufficiently dry for commercial purposes. The liquid portion of the produce from the rollers passes through a wire-woven endless apron, is received on an inclined platform, and flows off by suitable channels into tanks. It is then treated as desired by the usual process of boiling, skimming, &c.

CORNIDES, LOUIS, of Trafalgar-square, Charing-cross. *Certain improvements in saturating and coating or covering leather, paper, and textile fabrics, so as to render the same on the coated or covered surfaces thereof impervious to water.* Patent dated April 3, 1855. (No. 745.)

This invention consists in coating fabrics with certain substances, and in conducting the process so that the spirit or ether used as the solvent may be recovered.

MAAS, JACOB, and JAMES ADAMS, of White Hart-yard, Southwark, Surrey, millwrights and millstone makers. *Improvements in mills for splitting or grinding beans, peas, corn, and all kinds of grain.* Patent dated April 3, 1855. (No. 746.)

These improvements "consist in employing the periphery of a stone as one acting surface, the other acting surface being concave and adapted to the periphery of the other stone, and held in such proximity to the periphery of that stone which is the runner as to grind or split, as may be required, the grain passed between them."

FANSHAWE, HENRY RICHARDSON, and JOHN AMERICUS FANSHAWE, of North Woolwich, Essex, manufacturing agents. *Certain improvements in the manufacture of waterproof fabrics of the vulcanised, sulphurised, or cured class.* Patent dated April 3, 1855. (No. 748.)

These improvements consist in combining vulcanised, sulphurised, or cured fabrics of linen, cotton, hemp, or any of their intermixtures, with textures of wool, hair, silk, or any of their intermixtures, by means of an India-rubber solution, or flexible and insoluble cement.

JOYCE, FREDERICK, of Upper Thames-street, London, percussion-cap manufacturer. *Improvements in the manufacture of percussion-caps and other primers.* Patent dated April 3, 1855. (No. 749.)

Claim. — The employment of azotized or oxygenated vegetable substances as a covering or lining for percussion-caps and other primers.

EVRARD, MAXIMILIEN, civil engineer, of Saint Etienne, French Empire. *An improved continuous drawing compressor for moulding or bruising several substances or mixtures.* Patent dated April 3, 1855. (No 750.)

The machine described by the inventor consists of a plunger made to work to and fro in a cylinder, in the upper part of which is an aperture, through which the materials to be pressed are fed, the mouth of the cylinder opening into a mould. There may also be used a weighted cover, which, being made to press upon the materials, increases the resistance to their passage, and compresses them. At every back stroke the plunger is drawn clear of the feed aperture, while at every forward stroke it drives a fresh supply into the mould.

GREENWOOD, SAMUEL, of Sunderland, Durham, engineer. *Improvements in machinery for making rivets, bolts, nuts, and other similar articles.* Patent dated April 3, 1855. (No. 751.)

A full description of this invention will shortly be given.

NICKELS, CHRISTOPHER, of the Albany-road, Surrey, and JAMES HOBSON, of Leicester. *Improvements in weaving pile fabrics when wires are used.* Patent dated April 3, 1855. (No. 752.)

By this invention, in place of the person attending the loom acting on the treadles by his feet to give motion to the warps by jacquard and other apparatus, and by his hand;

to throw in and beat up the weft, the workman has simply to put in and take out the wires; hence, as his duties are comparatively light, he can weave with greater speed, though he possesses less skill and strength, than another weaver. In these improvements two shuttles are used, which are simultaneously thrown across in opposite directions in two separate sheds from two shuttle boxes, one above the other, but divided one from the other. These improvements apply, secondly, to looms where several narrow piled fabrics are made, side by side, in the same loom, and where two wires are used for making the pile of each fabric. "In this case," say the inventors, "two shuttles are employed for each fabric, which have toothed racks formed thereto, and they are put in motion in opposite directions by pinions or toothed wheels. There is a standing warp, tie warps, and a pile or terry warp, which is actuated by Jacquard apparatus. The two wires for each fabric woven at the same time are carried by two bars, and the wires are attached to arms fixed to such bars, the wires being attached through an elastic medium capable of giving way to the beat up." The motions are given to the several parts by means of cams on rotating axes.

CROWLEY, JOHN, of Sheffield, York, iron founder. *Improvements in the manufacture of malleable cast iron.* Patent dated April 4, 1855. (No. 753.)

Claim.—Combining chloride of sodium, carbonaceous matter, oxide of manganese, carbonate of lime, and wrought iron scraps, and the application thereof to the manufacturing of malleable cast iron.

MOUCHEL, LOUIS AMBROISE MICHEL, of Paris, France, and 166 Fleet-street, London, merchant. *An improved method of joining pipes, tubes, and ducts.* (A communication.) Patent dated April 4, 1855. (No. 755.)

"According to this invention," says the inventor, "the abutting ends of the pipes, tubes, &c., so to be jointed together are formed with flanges thereon, the flange on one of the said ends being at right angles to the pipe and the flange on the other of the said ends being inclined thereto, or forming, as it were, a single thread of a screw. A groove is formed in one of the abutting ends into which is inserted a washer of India-rubber or other suitable elastic material, and a projection is formed on the other of the abutting ends, which fits into the groove and against the elastic washer; a loose collar with two or more clip hooks is fitted over the two flanges by means of a bayonet joint, so that by turning the collar partly round, the clip hooks will be made to act against the inclined flange, and thus force the abutting ends of the pipes, tubes, &c., together, compressing the India-rubber or other flexible washer between them, and producing a tight joint. By turning the collar in the opposite direction, the pipes, tubes, &c., will be disunited."

SQUIRE, THOMAS, of Latchford, Chester, tanner. *Improvements in removing hairs from hides and skins.* (A communication.) Patent dated April 5, 1855. (No. 756.)

Claim.—The use of alkali waste, either alone or in combination with lime or other alkali, or alkaline earth.

GOOSTREY, WILLIAM, and GEORGE HULME, of Chedderton, Stafford, paper manufacturers, and CHARLES HOUGH, of the same place, manager. *Improvements in machinery or apparatus for manufacturing paper.* Patent dated April 5, 1855. (No. 757.)

This invention relates to apparatus to be used for the purpose of saving the waste of material arising from a portion being carried away by the overflow of water. The inventors cause the overflow to be discharged on to a wire gauze or other porous revolving surface enclosed within a tank.

CARLHIAN, ISIDORE, of Rue du Sentier, Paris, France, and FRANÇOIS ISIDORE CORBIÈRE, of Castle-street, Holborn, London. *Improvements in apparatus for making soda-water and other aërated liquids.* (A communication.) Patent dated April 5, 1855. (No. 758.)

This invention consists in dividing the spout of the tap into two small passages, one for the air and the other for the aërated liquid from the bottle, a small hole being made in the upper part of the spout over the air passage, by which the dripping from the end of the spout is prevented, &c.

CHESTERMAN, JAMES, of Sheffield, York, manufacturer. *Improvements in the manufacture of table and other like knives.* Patent dated April 5, 1855. (No. 759.)

This invention consists in methods of strengthening the tangs of knives, and of connecting them with the bolsters and handles, of which methods we shall shortly publish a full description.

BRAZIER, JOSEPH, of Wolverhampton, Stafford, manufacturer. *An improvement or improvements in revolving or repeating fire-arms.* Patent dated April 5, 1855. (No. 760.)

This invention consists in actuating the ramrods of the said fire-arms by the raising and lowering of an arm with which the ramrod is made to engage, by a pin on the end of the latter entering a curved slot in the end of the arm.

GOODYEAR, CHARLES, of Avenue Gabriel, Champs Elysées, Paris. *Improvements in self-inflating pontoons and life-preservers.* Patent dated April 5, 1855. (No. 761.)

The pontoon is made of India-rubber or waterproof fabrics in a series of compartments each separate from the others, so that in case one is perforated the rest remain air and water-tight. The partition between the compartments is formed of a plate or panel of India-rubber, whalebone, or stiff waterproof substance, the object being to prevent the pontoon from collapsing laterally, while it is distended lengthwise by a spar of wood. Each compartment has a tube by which the pontoon is self-inflated when drawn out. Loops or rings are attached to the pontoons at each end of every compartment, by which they may be fastened to spars or boats, or lashed together to form rafts or bridges. The life-preservers are made in the same way as the pontoons, but without rings and loops to the separate chambers.

LANE, DENNY, of Sunday's Well, Cork, merchant. *Improvements in obtaining power by water.* Patent dated April 5, 1855. (No. 762.)

This invention consists in employing a band of gutta percha, having affixed thereto a series of buckets.

FROST, JOSEPH EDWIN, of Goswell-street, Middlesex. *An improvement in ball or float cocks.* Patent dated April 5, 1855. (No. 763.)

In this invention the barrel has within it a seat for a lift or spherical valve, immediately below the spout or outlet of the barrel, and in a line with the centre of the valve there is an axis for the lever which carries the ball or float. On this lever is formed a curved incline which, when the float descends, acts on the spindle of the lift valve when used (or on the valve itself when a spherical valve is used), and thus lifts the valve off its seat.

HOLMES, HERBERT MOUNTFORD, of Derby. *Improvements in the manufacture of tyres for wheels.* Patent dated April 5, 1855. (No. 765.)

In this invention the tyre of the wheel is rolled on its exterior surface with a projecting longitudinal rib, so that when the wheel is on a hard surface the tyre will run on its longitudinal rib, but when on a soft surface the rib will penetrate, and the whole breadth of the tyre will rest upon it.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SHANKS, ANDREW, engineer, of Robert-street, Adelphi, Westminster. *Certain improvements in hand-drilling machines.* Application dated March 31, 1855. (No. 717.)

These improvements consist in making the frame or stock of the machine all in one piece, having a hollow or tubular handle at right angles, for steadying the apparatus while it is being used, the axis of the bevil-wheel or handle rotating inside of the said handle.

TIMMERHANS, ADOLPHE EMILE LAMBERT CHARLES, of Liège, Belgium. *Forcing projectiles applicable to artillery as well as to portable fire-arms.* Application dated April 2, 1855. (No. 728.)

This invention consists in "the forcing of a shoe or disc into the rifle grooves of a cannon or gun, by driving it along a conical part of the projectile, with the view of imparting a rotary movement to the projectile."

SHAND, JAMES, of the firm of Shand and Mason, Blackfriars-road, Surrey, fire-engine manufacturers. *Improvements in fire-engines.* Application dated April 2, 1855. (No. 730.)

Mr. Shand's improvements in the construction of the working levers consist in hanging the two-side levers to studs fixed into wrought-iron standards which are bolted to the sides of the cistern and project a short distance above the upper edge thereof. The levers are bushed at their working centres and fit on the fixed studs in the side standards. Two stay irons are fitted on to each side of the cistern to serve as a stop to the levers and limit the stroke of the engine. These stay irons are made to form a receptacle or holder for carrying the suction pipes and working handles when detached. The pumps are worked from transverse bars between the two side levers, thus allowing a central space for containing the air vessel and reservoir. The suction reservoir is unscrewed or detached when the engine is supplied or worked from the cistern, thereby leaving a perforated surface for the admission of water to the valves, and thus obviating the necessity of the two waycocks and other means hitherto employed for working the engine from the cistern.

WITTY, ROBERT CHRISTOPHER, of Toriano-avenue, Camden-road-villas, Middlesex, civil engineer. *Improved method of reflecting and diffusing solar light.* Application dated April 3, 1855. (No. 738.)

This invention consists in forming reflectors of white porcelain or earthenware highly glazed, with either plain or corrugated surfaces.

COWEN, JAMES, of Greycoat-street, and JAMES SWEETLONG, of Earl-street, Westminster. *A locomotive land battery.* Application dated April 3, 1855. (No. 747.)

This invention consists in forming a large land battery, running on wheels and driven by steam. To the framing of the battery, and at right angles to its length, are fitted strong and powerful blades turning upon a

hinge joint, so as to lie close to the framing when not in use, and to be instantly thrown out when required by the artillery-men or persons inside the battery, "the effect being to mow down any troops that come in contact with, or near the battery."

HILLS, ROBERT, of Caroline-place, City-road, THOMAS MILES, of Queen-street, Finsbury, and HENRY MONUMENT, of Caroline-place, City-road. *Improvements in bottles, jars, and other similar vessels to facilitate the corking or stopping of them.* Application dated April 4, 1855. (No. 754.)

This invention consists in making the neck of the bottle or jar with an internal screw.

LONGBOTTOM, ABRAM, of Soho Foundry, Meadow-lane, Leeds, York, engineer. *Improvements in preparing sand and materials to be used when casting.* (A communication.) Application dated April 5, 1855. (No. 764.)

The inventor employs a hollow cylinder which has at one end a projecting scoop opening into the cylinder, there being a valve to cover the opening. As the cylinder revolves the scoop takes up a quantity of the materials out of the trough below, and lifts it into the cylinder within, in which is a crushing roller, between which and the interior of the cylinder the matters are crushed as the cylinder turns. At the other end of the cylinder is a perforated partition, through which the ground materials are sifted.

GERNER, HENRY, of Moorgate-street, London, architect. *Improvements in polygraphic or writing or drawing apparatus.* Application dated April 7, 1855. (No. 771.)

This invention consists of an arrangement of jointed levers attached to a suitable frame work provided with the means for fixing two or more sheets of paper for writing or drawing on the same simultaneously, by means of pens clipped by a bar or bars in connection with the levers.

HUSBAND, RICHARD, of Manchester, Lancaster, hat manufacturer, and GEORGE MALLINSON, of the same place, pattern designer. *An improvement in the manufacture of hat plush.* Application dated April 7, 1855. (No. 775.)

In this invention hat-plush is formed from the weft or shoot, and an important feature of it is to allow the weft thread to float over any given number of warp threads, and then to bind through a number of alternate warp threads.

JONES, DAVID GRIFFITHS, of Harrington-square, Hampstead-road, Middlesex, M.D. *A new or improved farinaceous food.* Application dated April 7, 1855. (No. 776.)

This invention consists in combining the following ingredients in about the proportions named: 28½ parts of gluten, deprived of its water, dried, and pulverized.; 16 of starch obtained from Spanish semola; 1 of sulphur obtained from the heacandria tetrageni; ½ of earthy matter; 26 of vegetable albumen deprived of its water, and powdered; and 28 of vegetable gum.

WALKER, GEORGE, of Belfast, Antrim, spinning manager. *An improvement in power looms.* Application dated April 7, 1855. (No. 777.)

"My invention consists," says Mr. Walker, "in a means of stopping the loom when a warp end breaks. To each warp thread I connect a weight. These weights are kept in position by a frame or bar, which remains stationary so long as the threads and weights remain in their position. Immediately under this frame is another frame or bar, which is made to move backwards and forwards while the loom is in motion. As soon, however, as a warp end breaks, the weight connected to it falls partly into the lower frame or bar, which thereby communicates its sliding motion to the upper bar, and this bar being connected with a bell-lever spring, throws the bell on a slack pulley, and thus stops the loom."

PROVISIONAL PROTECTIONS.

Dated July 26, 1855.

1693. Christian Schiele, of Oldham, Lancaster, engineer. Certain improvements in obtaining and applying motive power.

Dated July 31, 1855.

1737. George James Dalman, of Alfred-villas, Enfield-road, Kingsland. An improvement in the manufacture of glazes for earthenware. A communication.

Dated August 23, 1855.

1911. William Lynall Thomas, of Chapel-place, Middlesex, gentleman. Improvements in projectiles.

Dated August 25, 1855.

1931. Honoré le François, of Vauxhall, Surrey. An apparatus for cleaning stew-pans, and other similar culinary utensils.

Dated September 24, 1855.

2127. David Chalmers, of Manchester, Lancaster, manufacturer. Improvements in machinery or apparatus for cutting the pile of woven fabrics.

2129. Joseph Beattie, of Lawn-place, South Lambeth, Surrey, engineer. Improvements in furnaces and boilers for the generation of steam, and in apparatus for the application and treatment thereof.

2131. Henry James Harcourt, of Bristol-street, Birmingham, Warwick, brass-founder. Certain improvements in bell-cranks and other parts of bell furniture.

2133. George Robert Hudson, of the firm of Hill, Hudson Brothers, and Co., of London-wall. An improved coffee-pot. A communication.

2135. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of casting solid and hollow articles in metal. A communication.

Dated September 25, 1855.

2137. John Laurence Gardner, of Providence-street, Walworth, Surrey, manufacturing stationer. Improvements in the manufacture, form, and mode of attaching buttons.

2139. Joseph Charles Clive, of Birmingham, Warwick, manufacturer. Improvements in photography.

2141. Etienne Laport, chemist, of Paris, French Empire. Certain improvements in the manufacture of candles.

2143. John Roberts, of Upnor, Kent, potter. Improvements in the manufacture of cements.

Dated September 26, 1855.

2145. Richard Crankshaw, of Blackburn, Lancaster, manager. Certain improvements in machinery or apparatus for sizeing or otherwise preparing warps for weaving.

2147. Felix Bouchet, mechanician, of Paris, France. An improved mechanical arrangement for elevating or lowering and moving forward or backward heavy or submerged bodies.

2149. Malcolm William Hilles, of Percy-street, Bedford-square, Middlesex, gentleman. An improved construction of rack for window-blinds.

Dated September 27, 1855.

2151. Henry Hughes, of Loughborough, Leicester, gentleman. Improvements in the means of compensating for the wear of machinery subject to rectilinear motion.

2153. Anaxagor Epaminondas Guilbert and Charles Louis Guillemère, of Paris, France. A new system of bridle for leading and overruling fiery horses.

2155. François Xavier Poignand, merchant, of Paris, French Empire. Improvements in the manufacture of wedges and keys. A communication.

2157. Charles Victor Théry, of London, chocolate manufacturer. A new preparation of coffee.

Dated September 28, 1855.

2159. Thomas Dyke, of Long Newton, near Darlington, Durham, gentleman. Improvements in grass-cutting machines.

2161. William Davy Gray, of Clifton-road, Surrey, master mariner. An apparatus or instrument for showing the course or direction and distance run by a ship at sea.

2163. Richard Locke Johnson, of Cabra-terrace, Dublin, brass founder and gas-fitter. Improvements in the manufacture of gas for illumination from peat or other substances, and in the apparatus employed in such manufacture.

2167. Edward Deas Thomson, of Duke-street, St. James's. Improvements in generating heat in steam-boiler furnaces.

Dated September 29, 1855.

2169. George Adamson, of Leith-street, Edinburgh, Mid Lothian. A travelling staging and crane or jenny, adapted for building piers and other harbour works.

2171. Joseph Mitchell, of Sheffield, York, engineer. Improvements in buffers and draw-springs used for railway and other purposes.

2173. David Chadwick, of Salford, Lancaster, gentleman, Herbert Frost, machinist, George Hanson, plumber, and John Chadwick, chemist, of Manchester. Improvements in apparatus for measuring water and other fluids and gas, applicable also as a motive power engine.

2175. Joseph Beattie, of Lawn - place, South Lambeth, Surrey, engineer. Improvements in the construction of railway wheels and axles.

Dated October 1, 1855.

2177. John Gedge, of Wellington-street South, Middlesex. Improvements in gas meters. A communication from Mathieu Dauriac, of Toulouse, France.

2179. William Illingworth, of Manchester, Lancaster, gentleman. Certain improvements in printing earthenware, china, and other ceramic manufactures.

2180. Charles Radcliffe, of Sowerby - bridge, York, manufacturer. Improvements in apparatus for moistening or damping woollen or other textile fabrics for finishing.

2181. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in ventilating hats or other coverings for the head. A communication.

2183. John Mitchell, of Dunning's-alley, Bishopsgate-street Without. Improvements in apparatus for washing and amalgamating ores and other matters.

2185. James Hervey Deming, of New York, United States. Improvements in the construction of projectiles. A communication from Oliver R. Burnham, of New York.

2187. George Baker, of High-street, Southwark, Surrey, ironmonger, and Charles Miller, of Flying-horse-yard, Southwark, Surrey, builder. Improvements in the construction of register stoves.

2189. Franz Uchatius, of Vienna, captain in the Austrian service. An improvement in the process of manufacturing cast steel.

2191. John Riddel Musgrave, Robert Musgrave, and James Musgrave, of Belfast, Ireland. Improvements in stoves for cooking and heating.

Dated October 2, 1855.

2193. James Chadwick, of Bank Wood, Charlesworth, Derby, manager. Certain improvements in machinery for carding cotton and other fibrous materials.

2195. George Rennie, of Holland-street, Blackfriars, engineer. Improvements in steam engine boilers as applied to the propulsion of vessels.

2199. William Edward Newton, Chancery lane, Middlesex, civil engineer. An improved mode of constructing elastic bed bottoms, applicable also to sofas, settees, and other seats. A communication.

2201. George Tomlinson Bousfield, of Sussex-place, Loughborough - road, Surrey. Improvements in locks for fire-arms. A communication.

2203. Richard Peyton, of Bordesley Works, Birmingham. An improvement in the manufacture of fences and gates where wrought iron is used.

Dated October 3, 1855.

2205. Thomas Greaves, of Manchester, Lancaster, veterinary surgeon. Improvements in the method or means of obtaining and employing motive power.

2207. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A method of ascertaining or indicating and regulating the height of water in steam boilers. A communication.

2209. Robert Wilkinson, of Staley bridge, Chester, mechanic. Improvements in machinery or apparatus for carding cotton, wool, and other fibrous substances.

Dated October 4, 1855.

2211. Robert Augustus Crosse, of Bartholomew-lane, London, gentleman. Certain improvements in founding printer's type.

2213. George Fréderick Gruet, of Bordeaux, France, merchant. An improvement in the construction of lamps.

2215. Henry Cornforth, of Birmingham, Warwick, manufacturer. A new or improved manufacture of hooks and eyes.

2217. Frederick George Sanders and Thomas Richard Sanders, jun., of Poole, Dorset. Improvements in the manufacture of pottery, earthenware, and other clay articles.

2219. William Hamilton, of St. Helen's-lodge, Hants. Improvements in the construction of tables, chairs, sofas, and other articles of furniture.

2221. Henry Brierly, of Chorley, Lancaster, machinist. Improvements in self-acting mules for spinning.

2223. François Modeste Demait, of Rue de l'Echiquier, Paris, France, gentleman. Certain improvements in the preservation of animal and vegetable substances.

Dated October 5, 1855.

2225. Thomas Grahame, of Elmhurst-hall, Lichfield, Staffordshire. Improvements in the construction of floating batteries or vessels in order to render them ball and shot proof.

2227. William Spence, of Chancery-lane, Middlesex. Improvements in cards for carding cotton and other fibrous substances. A communication from Désiré Ambroise Crignon, of Rue St. Julien, Rouen, France, manufacturer of cards.

2229. Joseph Bennett Howell, of Sheffield, York. Improvements in the manufacture of steel casting for ordnance and other purposes.

2231. Eliza Caroline Wren, of Tottenham-court-road, Middlesex. An improved construction of child's cot.

Dated October 6, 1855.

2233. William John Roffe, of Upper Holloway, Middlesex, gentleman. Improvements in stoves or furnaces.

2235. Benjamin Hoyle, of Stand, Pilkington, Lancaster, dyer. Certain improvements in the process of dyeing.

2237. James Torry Hester, of Oxford, surgeon. Improvements in invalid and children's chairs.

2239. William Rogers, of New-road, White-chapel-road, Middlesex, veterinary surgeon. Improvements in firearms.

Dated October 8, 1855.

2241. John Denner, of Albion-grove West, Islington Middlesex, gentleman. Improvements in furnaces for the consumption of smoke, drying tan, and other similar substances.

2243. William Rothera, of Hollins, Lancaster, machine maker. Certain improvements in machinery or apparatus for manufacturing bolts, screw blanks rivets, and other similar articles.

2245. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the method of, and apparatus for, rolling iron more particularly applicable to the manufacture of the tires of railway wheels. A communication from Jackson Brothers, Petin, Gaudet, and Co., of Rive de Gier and St. Chamond, France, iron manufacturers.

2247. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in condensers. A communication.

Dated October 9, 1855.

2249. Perceval Moses Parsons, of Duke-street, Adelphi, Middlesex, civil engineer. Certain improvements in connecting and securing the joints of pipes and tubes.

2251. William Chickall Jay, of Regent-street, Middlesex, warehouseman. An improved manufacture of collapsible hat or bonnet. A communication.

2253. James Murdoch, of Staple-inn, Middlesex. Improvements in extracting colouring matter from lichens containing such colouring matter. A communication.

2255. Julien François Belleville, civil engineer, of Paris, French Empire. An improved smoke consuming apparatus.

2257. William Henry Lancaster, of Hatfield-street, West Derby, and James Smith, of Sefton-street, Toxteth-park, Lancaster. Consuming smoke, and for generating and diffusing heat in furnaces, and in furnace or other flues.

Dated October 10, 1855.

2260. John Onions, of Wellington-place, Black-friars road, Southwark, engineer. A certain mode of collecting and means of applying for use the smoke, heated air, and other gases arising from engine and other furnace fires.

2261. John Gedge, of Wellington-street South, Middlesex. Improvements in machinery or apparatus for placing on card drawings used in various manufactories. A communication from Mr. Henry Sauzay, of Lyons, France.

2263. Richard William Pyne, of Southwark, Surrey, builder, and William Malam, of London-road, gas-engineer. An improvement in the manufacture of gas.

2265. John Parry, of Lower Broughton, Lancaster, manager, and Samuel Ivers, of Salford, mechanic. Certain improvements in looms for weaving.

2267. John Thornton, Albert Thornton, William Thornton, and Henry Thornton, of Nottingham, mechanical designers. Improvements in machinery for the manufacture of looped or knitted fabrics.

2269. William Crees Taylor, of Devonshire-road, Greenwich, Kent. Improvements in marine steam engines.

Dated October 17, 1855.

2328. Frederick Ayckbourn, of Palace New-road, Lambeth, gentleman. An improved apparatus for brushing and cleaning of boots, shoes, and trowsers.

Dated October 18, 1855.

2334. John Wakefield, of Birmingham, Warwick, machinist. Improvements in machinery used in the manufacture of screw-blanks, nails, pins, rivets, and other similar articles.

2338. John Graham, of Aughton, Lancaster, of the firm of Kay and Hilton, Liverpool, millstone manufacturers. Improved machinery for cleaning and dressing rice and other grain.

2340. John Davie Morries Stirling, of the Larches, near Birmingham. Improvements in coating silver, copper, zinc, and iron, and alloys of those metals.

Dated October 19, 1855.

2344. William Smith, of Salisbury-street, Adelphi, civil-engineer. Improvements in sewing machines. A communication.

2346. John Elce, of Manchester, machine maker. Improvements in self-acting mules for spinning cotton and other fibrous materials.

2348. Nathaniel Smith, of Thrapston, Northampton, engineer. Improvements in mills for reducing grain and other substances.

Dated October 20, 1855.

2350. Thomas Craven, manager, and Matthew Pickles, overlooker, of Birstall, York. Improvements in weaving.

2352. Pierre Antoine Henry Parant, ceramic materials and china-ware manufacturer, of Limoges, France. Improvements in manufacturing millstones.

2354. Thomas Valentine and Daniel Foster, of Belfast, Antrim, flax spinners and manufacturers, and Giles Haworth, of the same place, loom manager. Improvements in power looms.

2356. Hypolyte Gaudibert, of Rue de l'Arbre Sec, Paris, France, watch and clock maker. An improved construction of guard for preventing surreptitious removal of watches, purses, pocket-books, and other articles from the person.

[redacted]

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," November 6th, 1855.)

1443. William Pearce. Improvements in machinery for manufacturing certain articles of pottery, such as pipes, tiles, hollow bricks, and other like articles.

1447. John Gedge. Improvements in apparatus or mechanism for measuring liquids. A communication.

1459. Benoit Bonnet. Improvements in weaving.

1471. Henry Walker. Improvements in ploughs for ploughing or tilling land.

1481. Peter Armand Lecomte de Fontainemoreau. Improvements in axle-boxes or plummer blocks. A communication.

1483. Edward Joseph Hughes. An improved method of concentrating the colouring matter of madder, munjeet, spent madder, or any preparations thereof.

1484. Jean Baptiste de Lorenzi. Certain improvements in the construction of organs.

1491. Thomas Barling. Improvements in steam-engine, boiler, and other furnaces.

1493. John Birch. Improvements in the manufacture of iron.

1499. Robert Muckelt. Improvements in machinery for etching or engraving designs on cylindrical or other surfaces.

1549. Edmund Hart. Improvements in the manufacture of lace.

1615. Thomas Trapp. An improvement in connecting and disconnecting screw propellers and other shafts. A communication.

1650. Alfred Tooth. A process for preserving and curing by salting the flesh and hides of animals in an entire state.

1718. François Georges Hyacinthe Levavasseur. Improvements in oil lamps, and an improved chimney for oil lamps.

1933. Celse Eugène Capron. An improved cupping apparatus.

2014. Ichabod Nettleship. An improved spindle for the spinning of silk or other fibrous material.

2089. Lewis Dunbar Brodie Gordon. An improvement in electric telegraphs when insulated wires are laid under water or in the earth. A communication.

2117. John Henry Linsey. Certain improvements in account books and other large books.

2134. John Musto. Improvements in machinery for the manufacture of tobacco.

2151. Henry Hughes. Improvements in the means of compensating for the wear of machinery subject to rectilinear motion.

2157. Charles Victor Théry. A new preparation of coffee.

2161. William Davy Gray. An apparatus or instrument for shewing the course or direction and distance run by a ship at sea.

2180. Charles Radcliffe. Improvements in apparatus for moistening or damping woollen or other textile fabrics for finishing.

2196. Richard Threlfall and William Knowles. A certain improvement in looms for weaving.

2207. Richard Archibald Brooman. A method of ascertaining or indicating and regulating the height of water in steam boilers. A communication.

2227. William Spence. Improvements in cards for carding cotton and other fibrous substances. A communication.

2239. William Rogers. Improvements in firearms.

2245. John Henry Johnson. Improvements in the method of, and apparatus for, rolling iron, more particularly applicable to the manufacture of the tires of railway wheels. A communication.

2253. James Murdoch. Improvements in extracting colouring matter from lichens containing such colouring matter. A communication.

2266. Thomas Oddie, William Lancaster, and John Lancaster. Certain improvements in looms for weaving.

2302. Thomas Weatherburn Dodds. Improvements in firearms and ordnance, and in the projectiles to be used therewith.

2308. George Thomson. Improvements in steam engines.

2322. Ebenezer Mackinlay. Improvements in reeling apparatus for winding yarn into hanks.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

572. Henry Brinsmead.
640. Marc Klotz.
649. Andrew Lawson Knox.
650. James Wotherspoon.
655. Robert Booty Cousens.
656. Earl of Dundonald.
664. John Arthur Phillips.
683. Jean Jacques Ziegler.
771. John Thomas Way and John Manwaring Paine.
831. William Edward Newton.
856. Richard Dudgeon.
877. Thomas Ainsley Cook.
881. Henry Bollomann Condy.
955. William Keates.
1000. James Lawrence.
1032. Timothy Morris and William Johnson.
1045. Henry Clayton.
1123. Warren De La Rue.
2225. William Edward Newton.

LIST OF SEALED PATENTS.

Sealed October 30, 1855.

1029. John Henry Johnson.
1031. James Bowron.
1035. Thomas Williams and John Hobson Fuller.
1049. Charles Mertens.
1059. Joseph Hallam and John Elce.
1065. James Steele.
1071. John Herdman.
1085. Robert M'Connel.
1105. Charles William Siemens.
1131. Paul Firmin Didot.
1173. George Walker Muir and Matthew Gray.
1181. Edwin Haseler.
1183. Alexander Melville.

1224. Jean Baptiste Acklin.
1337. William Armitage.
1343. Henry William Ford.
1383. William Little.
1455. Thomas Beatt Sharp and Alexander Yorston.
1467. Thomas Swinburne.
1527. Christian Friedrich Werner and Loudovicus Piglhein.
1551. Julius Jeffreys.
1625. John Pretty Clarke.
1653. Edward Myers.
1671. Louis Antoine Ritterbandt and Joseph Bower.
1683. Richard Polkinhorn Huthnance.
1691. William Weallens and George Arthur Crow.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

N. C. C.—The prizes you refer to have not yet, we believe, been awarded.

J. R. R.—You should apply to an engine maker for the information you require.

J. De la Haye.—Yours is received, and shall be attended to.

Mr. J. Truran writes, in reply to Mr. Mushet's letter on Expansive Marine Engines in our last number, and refers to the *Mining Journal*, as one among others in which, as Mr. Mushet well knows, the merits of Craddock's engines and boilers are discussed. He avers that if those engines, &c., possessed the advantages which Mr. Mushet attributes to them, they would certainly be adopted. He also alleges that the Admiralty, &c., though necessarily cautious in adopting new inventions, are not indisposed to make use of those which possess real merit.

Errata.—Last number (1682), page 422, col. 2, line 4, *for* "incapable," *read* "capable." Same page and col., line 17, *for* $\frac{1}{2}\frac{W}{g}\times\frac{v^2}{H}$ *read* $\frac{1}{2}\frac{W}{g}\times\frac{v^2}{P}$.

In some of the early numbers of our last week's impression, page 417, line 31, the word "each" was printed instead of "both."

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

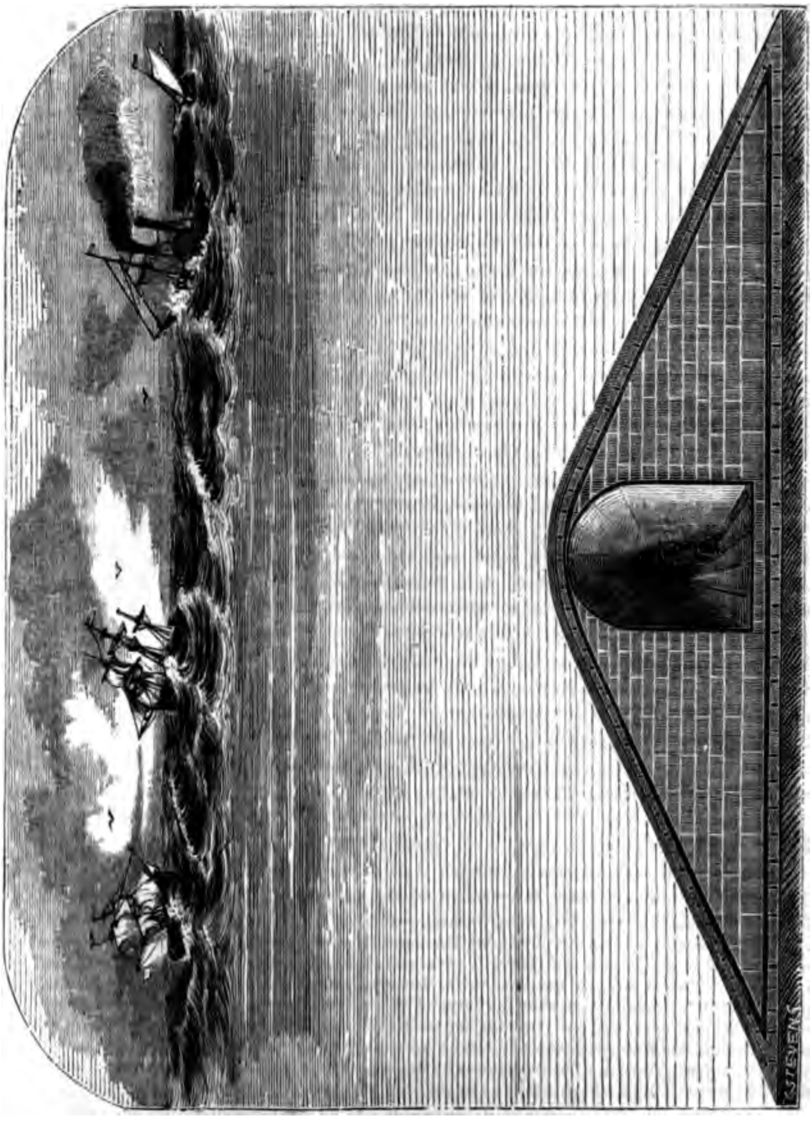
[redacted]

Mechanics' Magazine.

No. 1684.] SATURDAY, NOVEMBER 17, 1855. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

DE LA HAYE'S SUBMARINE RAILWAY TUNNEL.



DE LA HAYE'S SUBMARINE RAILWAY TUNNEL.

To the Editor of the Mechanics' Magazine.

"The war has already cost three thousand millions. With such a sum we might have completed the net-work of railways, both English and French. We might have constructed the Tubular Tunnel across the Channel."—Victor Hugo.

Sir,—It is now ten years since my plan for constructing submarine railways, by means of wrought-iron tunnels, first appeared in the *Mechanics' Magazine;* and I then expressed my belief that it would be possible to connect England and France by means of such a railway. Time has not changed that opinion; and, in fact, the realization of this project has been to me an ever present idea. I have now so far matured the invention that few difficulties would be found in the various operations connected with this gigantic structure. When this invention was first brought before the public, numerous objections were started against it; but, strangely enough, not against the principle involved, but against the details. Some asked whether it would be possible to prevent the action of sea water on the metal; or if such a tunnel could be ventilated; and last, not least, whether it would not be unsafe for England to allow such facilities to a foreign foe to invade her shores. Ten years has brought its changes, and I presume that the last objection has died a natural death; while as to the two first, men of science will agree that in adopting an invention the principle of which is sound, there can be no great difficulty in the details. Other plans for attaining the same end have, however, been before the public; and that it would be possible to bore through the earth composing the bed of the channel, on the principle of the *Thames Tunnel,* as proposed by a French engineer, I have no doubt; but the cost, if accurately ascertained, would appear fabulous in amount, and an equally formidable obstacle is, that the time required to complete the work would be considerably more than half a century. The channel which separates the two countries is little more than 100,000 feet wide; and instead of tunnelling the bed of the sea, I propose to tunnel the sea itself, by means of an iron tube, constructed in 100 divisions, each of 1,000 feet in length; and as all these divisions could be constructed at the same time, the whole could be completed within five years; bringing the two greatest cities in the world within six hours of each other, and eventually allowing an uninterrupted communication by railway with India and China. That all this will be accomplished before the end of the present century, I firmly believe; and the result of such a communication, in rolling back the tide of civilization to the old, and at present almost unknown world, must be fraught with events which at present can only be seen with a poet's or a prophet's eye.

The form in which I propose to construct the tunnel differs considerably from the original plan. I would construct an outer tube, or shell, with sheet iron, 1 inch in thickness, not less than 100 feet wide, and 25 feet in height; slightly arched in the centre, and forming a gradient towards the edge of the tunnel floor. As each division would be lowered on the bed of the water, I would construct an inner tunnel of the ordinary form in the centre of this outer tube, and build up the space between the two with stone work. The safety of the inner tunnel would thus become independent of the outer tube, which would be required mainly to exclude the water while constructing the railway tunnel. I would, however, adopt every available means for protecting the outer tube, by coating it in the same way as iron ships, and in addition would cover it with tarred canvas, and finally with oak planks, the joints of which would be caulked in the same manner as in vessels constructed with timber. It will be readily seen that the form of the outer tube would be such as to allow the waves to flow over, without injuring it; and this form would be especially essential near the shores, while in deep water it might be considerably narrower. The importance, however, of a great breadth of beam cannot be denied, as it would allow a larger space for stone work, which would add greatly to the stability of the structure, and render it almost

* See engraving on preceding page.

as enduring as the bed of the channel itself; of which it would, as it were, become an inseparable portion. The cost of this structure would not exceed ten millions sterling; but this is exclusive of approaches and stations, which would, of course, be built on a scale of magnificence corresponding with the railway of which each would be the terminus. Each station would be, in fact, the door of the neighbouring kingdom.

But while, in my opinion, the submarine railway is the only plan which can ever be adopted for uniting two countries separated by a channel, this plan is hardly applicable for rivers, in which the depth is not much greater than is required for the fleets of merchant vessels constantly sailing on their waters. Such are the Mersey, the Severn, and the Humber. Too wide to allow of bridges being constructed, the trade has been almost exclusively confined to one side of the river. Propositions, it is true, have frequently appeared before the public for supplying these localities with new editions of the *Thames Tunnel*, but these have not received much support; not that the cost of tunnelling has been considered as the great obstacle, but the safety of the plan has been questioned, and not without reason. The Mersey flows on a bed of red sand-stone, and consequently it would be impossible to bore through it without blasting; and as the water in the middle of the river exerts a pressure equal to 40 lbs. per square inch, it is probable that the concussion would cause the roof or arch to give way, in a manner rather unpleasant to those engaged in the work below, unless the tunnel should be a considerable depth below the bed of the river. In fact, the numerous fissures in the sand-stone would render such an accident not merely probable, but almost certain. Then, the site of both Liverpool and Birkenhead being considerably higher than the river, a tunnel sunk at a great depth would not be available for railway transit, without having approaches several miles in length. The obstacles, therefore, which exist towards the realization of such a project, by the hitherto adopted plans of tunnelling, are almost insurmountable.

But here the question suggests itself, Is it possible to tunnel under the bed of a river, just below the stream, without incurring the danger of a tragical accident? Towards the solution of this question, I have devoted considerable attention, and I beg to submit the result of my researches.

Previous to making any attempt at boring through the sand-stone, I would entirely isolate the water from its bed; or, in other words, I would remove the pressure of water from the sandstone immediately above the spot required for tunnelling. This I would effect by means of a structure somewhat resembling an iron pontoon bridge, and consisting of a number of wrought-iron caissons, each 100 feet long, 10 feet wide, and 6 feet in depth. By means of rods and cranks, I would connect one hundred of these caissons together, thus forming a raft 1,000 feet in length and 100 feet in width. The under part I would cover with tarred canvas, leaving a space of from 6 to 12 inches to be filled with sand. The upper part, or deck, I would load with large stones; but placed towards the sides, rather than on the centre. This structure being floated over the required spot, I would allow the water to enter the caissons, and sink it on the bed of the river. By leaving it some time on the spot before tunnelling, it would leave the sand-stone below as distinct from the river as the earth on which the town itself is built. The danger of the arch giving way would be thus almost entirely removed; while, at the same time, its giving way would be a matter of no consequence, for very little water could find its way into the tunnel under the caissons. After completing that portion of the tunnel, the water would be removed from the caissons, the structure floated, and then sunk over the next section to be tunnelled; and so on until the work would be completed. Of course, two such series of caissons would be required in order to commence the tunnel on both sides of the river at the same time. As the tunnelling would progress, I would construct an iron tunnel to support the roof, by means of sections of boiler plates bolted together, so that it would not be essential to build the inner arch before completing the communication from one side of the river to the other. This would allow the work of tunnelling to progress more rapidly, and the stone arch might be more fairly constructed than if built during the process of boring through the sand-stone.

By adopting this plan, the cost of tunnelling under rivers would be scarcely greater than in tunnelling in other localities, with the exception, however, of the caissons, by means of which the pressure of water would be removed from the arch. It is obvious that this plan can be adopted in any rivers, on whatsoever strata it may flow; whether it be stone, clay, chalk, or sand, the roof would in all cases be protected by the caissons, and would render an accident in tunnelling almost an impossibility.

I am, Sir, yours, &c.,

JOHN DE LA HAYE.

Liverpool, Nov. 6th, 1855.

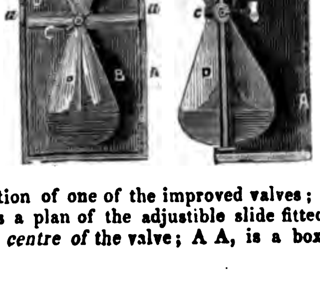
ALLEN'S REGULATING VALVE FOR FURNACES.

(Patent dated May 10, 1855.)

MR. M. ALLEN, of Worship-street, London, builder, has patented a very useful valve, for regulating the supply of air to furnaces, &c., which is already becoming extensively used in the metropolis. It is much the cheapest and most easily operated arrangement that we have as yet seen adapted to the above purpose. The valve is formed by fitting in the body of a plate swung centrally on two pivots or axes, a vessel made somewhat in the form of an hour-glass, the narrow centre of this vessel being on a line with the pivots on which the plate swings. One side of the vessel is charged with sand or other suitable material, and through the centre of the vessel is placed a slide, or its equivalent, which is worked by a thumb-screw. In order to set the valve, that half of the plate which carries the weighted part of the vessel is placed uppermost, and the valve-plate is open, both at top and bottom. It is prevented from falling over inwards by a rack or other suitable contrivance. When the slide is opened to the desired extent the sand falls with more or less rapidity into the under part of the vessel, and, as it does so, gradually brings the valve-plate into an upright position, and so closes the passage to which it is fitted. Instead of the hour-glass shaped vessel being fixed to the body of the valve-plate, it may be connected to one of the pivots on which the plate swings, or it may be fitted to the plate in any other convenient manner.

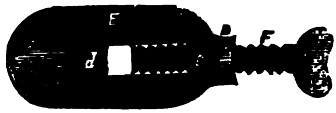
In fig. 1 of the accompanying engravings is shown a front elevation, and in fig. 2, a

Fig. 1. Fig. 2.



section of one of the improved valves; fig. 3 is a plan of the adjustible slide fitted in the centre of the valve; A A, is a box or case; B B, is a metal plate, free to swing upon its axes, C C, supported in the sides of the case at *a a*; D D is a vessel of the particular shape shown, made in two parts, united at the collar, *b*; E is a plate or disc of metal interposed between the two parts of the vessel, D. This plate is slotted out

Fig. 3.



or cut away from *c* to *d*, while a thumb-screw, E, working through the collar, *b*, regulates the size of the aperture in the disc. The vessel, which is made by preference of glass, is accurately fitted into the plate, B, and before being fixed therein, has one of its parts filled or nearly filled with sand, or other suitable material which will act in a similar manner to sand, for the purpose required; *e* is a rack held in an inclined position between the arm, *f*, and ledge, *g*.

In fitting one of these valves to regulate the supply of air to an ordinary stationary furnace, a passage or air-flue is formed, leading from the front of the brickwork in which the furnace is set to a box at the back of the furnace door. This box is perforated, to divide the air entering into numerous small jets or streams. The case and valve are fitted into the mouth of the air passage. On a fresh supply of fuel being introduced into the furnace, that part of the valve containing the sand or other suitable material is turned upwards, and inclined backwards against the rack, which will place the valve in the position in which the greatest amount of air can pass through it. The inclination of the valve, and consequently the volume of air allowed to flow in, may be increased or diminished by moving the rack backward or forward. The sand running from the upper to the lower part of the vessel will gradually lessen the inclination of the valve, and consequent inflow of air until the valve assumes the horizontal position and closes the passage. "The time this will occupy," says the inventor, "will of course depend upon the size of the aperture in the disc between the two parts of the valve vessel. No fixed rule can be given, as the time air should be allowed to flow in must depend upon various circumstances, which may in no two cases be identical, but which slight experience with each furnace or fire-place will readily determine. However, as in every case a larger supply of air will be required on adding fresh fuel than will be needed, as the processes of distillation and consumption proceed, my valves will be found of

[redacted]

benefit in all cases where it is sought to burn fuel with economy, and without black smoke issuing from the furnace chimney." The valve may, if it is thought desirable, be fitted to an ash-pit, or to a casing at the side of a furnace door, or in any other convenient position.

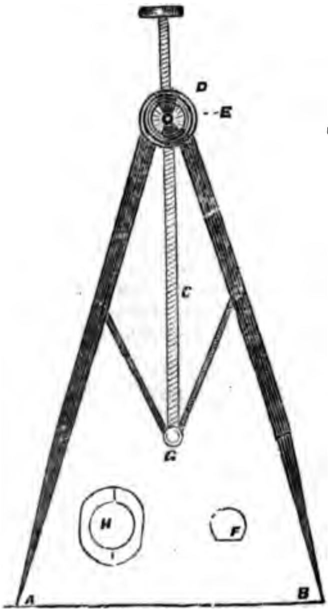
FATAL SUBMARINE EXPERIMENT.

Mr. H. Levy, of France, was suffocated on the 11th of last month, at New York, while making a submarine experiment. The following narrative of the event has been forwarded by M. Louis Bonnet to the *Scientific American*:—"The apparatus he used for his experiments consisted of an india-rubber armour, with a metallic helmet. It dispensed with the air tubes and force pumps used at present with the ordinary armour, instead of which he had a supply of oxygen gas, enclosed in an india-rubber receiver, attached to his body. The flow of the gas was regulated by means of a tube and faucet; and a vessel containing slacked lime and caustic soda, placed on his breast, was intended for the absorption of the carbonic acid gas expelled from the lungs. His ballast was composed of a sufficient quantity of leaden weights attached to different parts of his body. Several experiments had already been made with the apparatus, with sufficient success to inspire, in the minds of all connected with him, complete confidence in the practicability of the process. At one time he remained twenty-five minutes under water. Another time he remained about one hour and fifteen or twenty minutes in the armour—part of the time under water, and the rest on land—and was enclosed, air-tight, in his machine. The experiment which was the cause of his untimely death took place at Hunter's Point, Long Island, on Friday, 11th inst., in the presence of several persons residing in New York City, who intended to apply the invention to immediate practical use. After being dressed in the armour, he walked into the water a short distance, and returned, feeling unwell, and requested to be cooled. After this, in spite of our entreaties to postpone the experiment, he went in again, until he was about three feet below the surface. A rope was fastened to his helmet, and held in his hands, for the purpose of giving signals and guiding him. Express orders had been given by himself not to draw him out on any account unless a particular signal was made. He remained thirty minutes below, giving, during that time, the signal that all was right. How this was done I do not know; perhaps it was caused by the motion of the water. At any rate, according to agreement, he was withdrawn; and perceiving that something was wrong, we quickly cut the whole apparatus to pieces, to liberate him; but alas! the poor man was found to be dead! All our efforts to revive him were of no avail. He was a man of brilliant talents, and full of bright promises."

GOVER'S INDICATING COMPASSES.

The following description of an improvement in compasses has been forwarded to us by the designer, Mr. H. C. Gover, of London.

"The principle of these compasses is at once seen on reference to the engraving.



The points of the compasses, A, B, are extended or contracted by means of the screw, C, which works through a box, D,* and the nut, E. The screw is filed flat on one side, as shown at F, and on the flat surface, is marked an index, which at the point, D, indicates the distance between the points, A, B. The screw is attached to the levers at their juncture, G, by a swivel, so as to permit them to work round. The legs of the compasses are hollowed out, as shown at H, so that they shut quite close. As the points of the compasses are liable to become sen-

* This has been accidentally omitted in the engraving; the letter D indicates its position.—Ed. M. M.

sibly diminished by wear in the course of time, the top-piece, D, may be made to screw tightly on, and be from time to time re-adjusted to the index."

WROUGHT-IRON FLYING BATTERIES.

If thick wrought-iron plates can make effectual floating batteries, why may they not make excellent flying batteries and approaches against fortifications? This would certainly be a very excellent revival of the old method of attacking castles and walled cities by covered approaches moved on wheels, in which the workmen wielded their battering-rams with terrific effect. We recommend the plan to the contending powers of Europe; it is one which deserves to be tried against the north side of Sevastopol.—*Scientific American.*

EVILS OF READING IN RAILWAY CARRIAGES.

Several instances are lately recorded where persons who were in the habit of reading much in railway cars had become nearly blind, and an express agent near Boston had totally lost his sight, it being imputed to that cause. It appears the jolting motion causes the eye to strain in catching the separate letters, and makes their effect on the retina very injurious.—*American Exchange.*

Vis: A Treatise on the Predominative Influence of the Sunbeam through Creation, not only in the Production, directly or indirectly, of all Terrestrial Phenomena, but as the Sole Agent in occasioning and sustaining the movements of Heavenly Bodies. By Edward Brailsford Bright. London: John Weale, High Holborn. Liverpool: George Philipson. 1855.

(*Review concluded from p.* 443.)

We have now arrived at that portion of his work in which our author developes his own theory. Before we make any comments, we think it is better to lay before the reader, as succinctly as possible, what Mr. Bright means by "Vis," and *how* he applies it to the explanation of the various classes of cosmical phenomena.

There cannot be a question that the influence of the sun's rays as conducive to animal life and organisation, as well as in producing the phenomena of light and heat, and certain chemical effects which are ascribed to a quality of the ray to which the term "actinism" has been applied, is most varied and important. Many eloquent passages from popular philosophical writers are quoted in this portion of the book, in which we heartily concur. Here, however, as elsewhere, Mr. Bright allows no opportunity to escape of bringing objections against the Newtonian doctrine; and if we permit these to pass without comment, it is not because we see much force in them, but because our limits preclude our examining all the objections of this nature, whose name is Legion.

Assuming, then, the actinic, luminiferous, calorific, and electric agencies of the sun's rays to be referable to the same ultimate cause, Mr. Bright (to use his own words) employs the term "'Vis,' (signifying power) as a generic denomination, applied either collectively, to express the totality of force, or individually, as typical of their co-relationship in an inseparable band of union one with another—if not of their absolute identity."—Page 39.

The principle of action of "Vis," as supposed to manifest itself in all phenomena, both terrestrial and cosmical, the author describes "as a law of equalisation," which he defines as "consisting *in the transfer of physical force between combinations of matter possessing a comparative excess of 'Vis' and others incorporated with less, or comparatively deficient.*"

The well-known law of caloric and of electricity, by which it is ascertained that there is always a tendency to establish an equilibrium or equality between bodies charged with unequal amounts, are made the basis of this portion of Mr. Bright's theory.

We may here, however, mention, that he at once discards the modern doctrine, that "there are two distinct electrical fluids antagonistic to one another, each attracting the other, and repelling itself;" by which supposition alone some of the phenomena accompanying the transfer of electricity from body to body have been satisfactorily explained, and falls back upon Franklin's theory of one fluid, which he tells us has been "arbitrarily negatived." We cannot, however, agree with him in his opinion, that he has shown that the assumed inadequacy of this theory to account for certain phenomena rests on insufficient ground. The peculiar phenomena, to explain which philosophers admitted two fluids, are not, as far as we can find, treated of at all in this place.

However this be, the Franklinian theory as applicable to the case of a pith-ball placed in the vicinity of the prime conductor of an electrical machine, is made to serve as the basis of the theory of "Vis" as applied to the motions of the heavenly bodies. The alternate attractions and repulsions of the pith-ball by the prime conductor are referred en-

tirely to the difference of the state in these bodies as regards electricity: any *difference* in the amount of electricity residing in them resulting in attraction; while the equalization which takes place on their near approach causes repulsion until the lighter body parting with its "Vis," which escapes into the surrounding medium, returns again to the prime conductor to be again charged with the fluid.

In bringing this theory to bear on the heavenly bodies, Mr. Bright, first of all, considers the sun to be the centre, whence a vast quantity of "Vis" emanates in all directions and fills space, the energy of the "Vis" diminishing in the inverse ratio to the square of the distance from the sun.

The heavenly bodies are *supposed* to differ from one another in their power of throwing off "Vis" thus received from the sun: and this difference of their powers in this respect is supposed to result in their establishing themselves permanently at the respective *mean distances* from the sun at which we find them.

There is a certain amount of "Vis," it is argued, which they are capable of absorbing or assimilating: they will therefore assume such a position that the amount of "Vis" they receive from the sun is exactly the same as that which they are capable of throwing off; for of course, being fully charged, they cannot assimilate more than they already possess. Thus the *mean distances* of the several planets are fixed by a *necessary* law.

The next phenomenon accounted for is *rotation.* Supposing, then, the planet subjected to the direct emanation of "Vis" from the sun to be originally at rest, it is inferred that the portion of the planet under the immediate influence of the sun's rays will become *surcharged* with "Vis," while that more remote will by radiation become *minus*, as compared with the other hemisphere. Hence it is presumed the planet will revolve upon its axis in order to equalize the state as regards "Vis" of the two hemispheres, so that the surcharged portion may obtain an opportunity of parting with its redundant "Vis," while the negative portion will, by coming under the immediate influence of the sunbeam, supply its deficiency. "The *period* of the diurnal rotation," it is said, will "depend, chiefly upon the properties of reflection, absorption, and radiation — qualities which, as previously mentioned, are *probably* possessed in a different ratio by the various cosmical bodies," and "will become as exactly defined as the mean distance itself."

"The *direction* of rotation is accounted for by the circumstances of the sun itself rotating upon its axis, which will result in a greater impulse being communicated from one portion of the solar surface—that advancing—than from the other." And this difference, though not capable "of detection by us, would exercise a determinative tendency with reference to the direction of planetary rotation."

To account for *onward progression*, it is said that this "would directly ensue as a consequence of rotation; for as the great bulk of the solar force is thrown off *in one direction* (by the side passing away from the sun), whilst the opposite portion of the surface (or the side approaching the sun), which has already dissipated the chief part of any superabundance, is comparatively in a state of equilibrium, the energetic radiation in one direction, and the absence of any equivalent in the opposite direction to counterbalance it, will result in a reaction of the physical forces during their diurnal liberation by the planet, and occasion onward motion of the planet itself." This is explained on the principle of the motion occasioned by the escape of steam from the extremities of the arms of Hero's wheel, and of water in Barker's mill.

The medium itself, it seems, in which the planets move, would produce a tendency to accelerate this motion; for the adjacent layers on the eastern side (that receding from the sun) would become impregnated with its redundancy, and would cause the body "to move onward into fresh regions of the medium, in order to liberate with greater facility the subsequent surcharges of physical power, absorbed by each consecutive part of its surface on becoming exposed to the solar radiations."

Hence we arrive at the most unexpected result, that "the luminiferous medium—if it exists in space, and is possessed of the attribute of density—will probably influence the onward movements of the planetary bodies *by adding* to the velocity with which they may travel."

The "nutation" or tilting of the axes of the planetary bodies is accounted for by the unequal distribution of the sun's rays on the earth surface, and consequently "the tendency of nutation is to correct this unequal distribution of the rays in relation to the degrees of latitude so far as may be consistent and compatible with the retention of the more important phenomenon of axial rotation." The precession of the equinoxes it has not been thought necessary to explain on this new theory.

In accounting for the next peculiarities of planetary motion, viz.: "The solar excentricity of the orbits of the revolution which the planets pursue round the sun, and their elliptic shape," Mr. Bright takes another opportunity of urging his objections to the Newtonian theory, which is generally

supposed so admirably to account for the elliptic form of the orbits, and in so doing places in the strongest possible light his own misapprehension of the doctrines he impugns, and leaves us no room for doubting that his notions of it are acquired *entirely* from popular illustrations, and not at all from an actual mathematical inquiry into the system. We have the old "remarkable struggle" between the centripetal and centrifugal forces amplified and magnified, and what appears to Mr. Bright a most forcible objection urged against this view of the case; the gist of this being, that as one of these forces increases, "while the other diminishes, and *vice versâ*, 'in every half of the' planet's orbit, they would exactly equalize; and having once attained a mean, it is," Mr. Bright thinks, "but reasonable to conclude, that if such powers really existed, the mean would be maintained."

Now we have already shown that it is contrary to fact to describe the Newtonian doctrine as a struggle between two antagonistic forces. We have now further to remark that *direction* of motion as well as velocity has necessarily to be taken into account; and although twice in a revolution the *velocity* of the planet is the same as it would be in a circle *at the same distance*, yet, as in the circle the motion would be at right angles to the distance, while in the planetary orbit it is *oblique*, this circumstance alone prevents the ellipse merging into a circle.

The explanation of the elliptical motion itself is more dependent on a supposed coincidence in direction of all the major and minor axes of the planetary orbits. This has *not* been, as our author assumes, decided by observation. The motion of the sun itself in the heavens, amounting to no less than 33,500,000 geographical miles per annum, is *supposed* to furnish a clue to this phenomenon; "for," it is argued, "in one portion of the planets' revolution their course would be in a direction exactly the reverse of the sun's, and the distance traversed proportionately increased by a difference in direction; while, in the opposite direction, when coincident with the sun's course, a greater distance would remain to be traversed in order to overtake the sun."

The difference of inclinations of the planetary orbits is stated to be a consequence of the annual nutation of the planetary axes; the preponderance of the sunbeam radiated from the northern hemisphere of each planet being assumed to produce a *slight* but peculiar progressive downward motion; and an upward motion when the conditions are reversed.

The author considers it unnecessary "to enter into an examination of the details of the minor and periodic variations produced by the perturbative action between the planets themselves:" so that, in this most important and interesting field, we are left without the means of comparison between the New Theory and the Newtonian, whose greatest triumphs have been accomplished here.

Such, then, being the theory of Mr. Bright, in its main features, which he considers as better entitled to a favourable reception in the nineteenth century, that has witnessed so great progress in the observed sciences, than that of gravitation, we will subject the various parts of it, as above stated, to an impartial scrutiny. We are not conscious of having omitted anything material in the summary just given of the theory of "Vis." If we have done so unintentionally, we are open to correction. Our remarks are meant in no unfriendly spirit; but in truth a theory is utterly valueless which will not stand the ordeal of a careful inquiry. Mr. Bright has not thought it necessary to be very nice in his canvassing of the Newtonian theory. He must not be offended if his own be handled somewhat roughly; indeed he should rather, as a philosopher, rejoice at such treatment, as, if true, it will in consequence be only the more firmly established.

Now, the first thing that strikes us is the extreme tenuity of the chains in the inductive link by which the theory of "Vis" is connected with the theories of heat and electricity upon which it is based.

It is allowed that if two bodies possessed of different degrees of heat are brought into the neighbourhood of one another, the one will give off, and the other will take in caloric, until they reach the same temperature. On this law alone rests the whole analogy of the distribution of "Vis," so far as it respects heat.

The law of interchange of electricity is, as we have already stated, not of so defined a character. The more usual mode of accounting for a considerable class of phenomena, is by the supposition of the existence of two fluids of opposite characters, each attracting the other, and repelling itself. While, therefore, the question of the existence of *two fluids* is, to say the least, of so unsettled a character as at present, it seems hardly philosophical to base the theory of the motions of the heavenly bodies upon a hypothesis of the action of one electric fluid only. Electric currents, moreover, have never yet been made sufficiently powerful to set or maintain in motion *heavy* bodies. The attempts to utilize electricity by applying it as a motive power, in the place of steam or other agents, have hitherto failed. It has been found hopeless to induce motion in heavy

bodies by the agency of electricity, except by placing them within a *very small* distance of the prime conductor. All the cases of *motion* arising from this cause, therefore, so far as we are aware, are of a comparatively very slight nature. Electricity is so far analogous to the undulations producing light; the motion produced by it is small, but rapidly communicated, and propagated to very great distances.

The weight of a body, then, to which the electric fluid is capable of communicating an appreciable motion *must* be very small. Mr. Bright himself tacitly allows this, when in his grand illustration of electrical action, at the end of the third chapter of his work—which is, in fact, the main link in his chain of inductive argument—he limits the experiment to the case of a light body, a pith-ball for instance. Nor is the case of storms, in which the fluid attains such an intensity as to be capable of violently rending in pieces non-conducting substances which impede its progress, an exception. The earth and the clouds being charged with fluid in opposite states, or, if you please, say for the sake of argument, with the same fluid in excess and in defect, the only visible *attraction, i. e.* the only attraction which produces sensible motion that is exercised is on the clouds, composed of light vapours. In our author's experiment substitute any heavy substance for pith, and none of the effects he describes would be produced, whatever be the conducting power of the substance employed. Nor will the author's views with respect to the causes of cosmical phenomena as analogous to those produced by the sunbeam receive much corroboration, should it be established that light, heat, electricity, &c., are but different manifestations of the same powers: for, granting that they are so, and are, therefore caused by the undulations of some medium—the very nature of an undulation consists in its being a *small disturbance* of the particles of the medium propagated with a greater or less velocity. Professor Thomson, in his treatise on the "Mechanical Value of a Cubic Mile of Sunlight," deduces the result that "merely to commence the illumination of *three cubic miles* requires an amount of work equal to that of a horse-power for a minute," and that "the same amount of energy exists in that space, as long as light continues to traverse it." If, therefore, the horse-power expended in the illumination of three cubic miles, which is the measure of the mechanical effect which these three cubic miles of light are capable of producing, be but *one* horse-power a minute—*how very minute* is the mechanical value of such portions of the sunbeam as come within the sphere of each individual on the earth's surface; *how minute*, that is, compared to the effects of other powers within the range of our experience.

Considering then, that, as far as we are aware, none but very *light* bodies are capable of receiving appreciable motion from the ordinary action of electricity, we do not think that Mr. Bright's theory, omitting, as it does, all considerations regarding the weights or *densities* of the heavenly bodies, can be esteemed satisfactory, even as regards the mere relative mean distances of these bodies from the sun, supposing them stationary.

The mode by which *rotation* is accounted for is even less satisfactory; and has, we believe, not the *shadow* of analogy to support it.

It is *supposed* that one hemisphere of the planet being, as it were, flooded by "Vis," while the other is radiating the "Vis" it possesses into space, the planet will *rotate*, in order to establish an equilibrium of "Vis" between the two *opposite hemispheres*. We say that no case of rotation arising from such a cause is presented to us at the earth's surface. Nor can we understand the *mechanical* principle on which such a rotation could be produced. The pith-ball, in our author's experiment, ought, to support his views, when brought near the prime conductor, and therefore charged with an excess of fluid on that hemisphere brought into near proximity to it, to rotate about an axis, in order to bring the other hemisphere in such a position as to equalise the "Vis" on the ball. No such motion has ever been observed. On the contrary, all the phenomena of electricity with which we are acquainted seem to point to the law, that to *equalise* its distribution, the *fluid itself moves round the body impregnated with it*, instead of the body moving round with this object.

Supposing, too, a progressive motion of the planet produced by the agency of "Vis" operating in a manner analogous to the electric fluid, we cannot see how, if the body had a tendency to rotate from the cause assigned by Mr. Bright, the axis of rotation could fail to be *perpendicular* to the plane in which the body moves. The inclination of the axis—in the case of the earth, at an angle of 23° 30′—to this plane, seems not only to admit of no rational explanation on this theory, but to be antagonistic to it.

The explanation of *nutation*, or the tilting motion of the axis, is liable to the same objection, and also to another. The author's explanation is founded on the supposition that this *nutation* completes its period in a year. Now the terms in the expression for nutation, which depend on the sun's longitude, and completing their period in a year, are by no means the largest. The principal

terms depend on the *sine* and *cosine* of the mean longitude of the moon's ascending node, and therefore require a period of upwards of nineteen years to complete their variations,—a fact totally unaccounted for, and not noticed at all by Mr. Bright.

The *onward progression* of the planets is ascribed to the re-action arising from the throwing off of the superabundant "Vis" from that portion of the body which by rotation is carried out of the immediate influence of the sun's ray, on the principle of Barker's mill and Hero's wheel.

Here we are met with the difficulty above stated, that if "Vis" be similar to electricity, it will equalise itself by travelling over the surface of the planet until equilibrium is restored; so that, while one hemisphere is under the immediate influence of the sun's rays, the "Vis" so acquired will immediately travel round on all sides of the planet.

There are also other difficulties of a *mechanical* nature. In all cases of motion, by a re-action of this sort, the fluid whose escape causes the motion must have a density comparable with that of the body which it sets in motion. The total amount of work which the issuing steam is capable of expending in the production of motion is represented by one-half its *vis viva*, that is, $\frac{1}{2}\frac{W}{g}V^2$, where W is the *weight* of the stream that issues in a minute; V the velocity per minute with which it issues; and g the accelerating force of gravity. This applies equally to the water producing motion in Barker's mill, and the steam which turns round Hero's wheel.

Neither heat nor electricity have any *density* (considering them fluids) comparable to that of the earth; they are, to all intents and purposes, *imponderable*; the *vis viva* of the issuing "Vis," therefore, on Mr. Bright's theory, would be inappreciable, and incapable of producing the motion assigned, at least on the ordinary principles of mechanics. The analogy of Barker's mill and Hero's wheel, &c., completely fails.

The author arrives at the unexpected result, that the luminiferous medium supposed to permeate space will probably add to the velocity with which the planets travel. Now, it appears to us, that even allowing that the strata which are impregnated with "Vis" would give way to *new strata*, this condition would be fulfilled by the *lighter fluid*, viz., the luminiferous medium yielding, and new portions of it coming into contact with the planet, rather than the whole heavy mass of the planet should move to seek the fresh strata of the medium. This is the process which takes place in the only case which we know that bears any analogy to that here stated by Mr. Bright, viz., the communication of heat by convection. In this case the particles of air in immediate contact with the warm body abstract from it a portion of its caloric, expand, and then, in accordance with the principles of gravitation, ascend, and their place in contact with the warm body is supplied by other particles, and the process is repeated. Here there is no tendency in the body to rise into the atmosphere to seek fresh strata of cold air, or to move laterally for that purpose; but the warmed and thus rarified strata of the air immediately move off, and yield their places to colder and denser strata.

Besides, supposing motion could be induced by the reaction of "Vis" radiating from the planet, as this always takes place in one direction, if the principles of mechanics apply (and why should they not?), the result must be a continually accelerated motion, especially as the medium instead of resisting is supposed to add to the velocity; and the planet's period must become shorter and shorter on each revolution round the sun. Moreover, a velocity being once generated by this reactionary force, the planet's subsequent motion would be of a complicated nature: for, first, it would immediately be carried out from its *mean distance* of equilibrium of "Vis," with regard to the sun, and would therefore be subjected to the action of a force tending to bring it back unto this position; it is also acted on by the reaction above mentioned, and having a definite amount of velocity, its subsequent motion will be due to the combination of these *three* causes: and it would, in all probability, while it must, as we have seen, go on accelerating without limit, cause the body to oscillate on each side of the *mean distance*, in what particular manner, without having the *data* of the problem before us, it would be impossible to predict.

The explanation of the elliptic motion is not only founded on a misapprehension with respect to the direction of the major axes of the elliptic orbits, but also supposes that the sun's motion in the heavens is directed towards the part of the heavens defined by the *mean* position of the planes of the planetary orbits. This is not, so far as we are aware, the case; hence Mr. Bright's explanation, which is in every respect most vague and unsatisfactory, utterly fails.

We think our readers will excuse our attempting to follow our author into the details of other cosmical phenomena, supposed to be explained on his theory. The objections we have urged against its *main principles* as applied to planetary motions at all—urged we may add in all good faith, and with no disposition whatever to *seek for*

faults—are, we submit, so stringent, that until they are satisfactorily disposed of, it is useless to pursue the consequences of the new doctrine as applied to the more intricate phenomena presented by the satellites and comets. We think that we have shown that Mr. Bright's theory will not stand the test of a philosophical inquiry. Let us not, however, be misunderstood. Like Newton, we do not presume to define *how* the mutual attraction of bodies takes place; and it *may possibly* hereafter appear, that it resides in some power of which electricity is one of the manifestations: but we will boldly say, that if this should be hereafter found to be the case, that power will not be found to act in any way analogous to that supposed by Mr. Bright, but strictly as a central gravitating force according to Newton's doctrine. It must be borne in mind, that if Mr. Bright's notions were correct, a planet placed at its *mean distance* from the sun, determined by its powers of absorption and radiation of "Vis," would be under the action of no force. Force only begins to be called into play, in his theory, when the amount of "Vis" radiated ceases to be equal to the amount received from the sun, and will then be attractive or repulsive, according as the radiation is *greater* or *less* than the *mean* radiation. In accordance with the principles of mechanics—this force being necessarily small for small distances either way from the mean distance, any motion impressed on the planet, if considerable in amount (as is always the case), whether generated by the action of the "Vis" itself or any other cause, would carry the planet *some distance* from *its mean* position before the action of the force would be sufficient to bring it back towards its mean place. This is a circumstance which it is of great importance to recollect in judging of the new theory.

Weight of bodies, and the phenomena connected with this property of matter are not taken into account by Mr. Bright, but tacitly assumed to be of an entirely different nature to "Vis," and subject to different laws.

Now compare with this the beautiful and simple theory of Sir Isaac Newton. Mr. Bright complains of the nature of the experiments and observations on which Sir Isaac Newton based the theory of universal gravitation. But how pregnant and full of meaning are they! How different from his own fundamental experiment of the pith-ball, in the explanation of which philosophers are not even agreed. Newton, by observing an apple fall to the ground, infers that it is solicited by a force tending to the earth's centre. He calculates the amount of that force, and finding that it is constant, and such as to cause any heavy body at the earth's surface to fall through 16 feet in the first second of its motion, he then imagines that this force which operates at the surface will certainly operate at greater distances, probably with an energy decreasing as the distance increases; and that the moon's motion may be due to its action. He therefore subjects this case to an investigation, and discovers that a body placed at the moon's mean distance would describe a circle round the earth's centre under the action of the force gravity, diminished in the ratio of the square of the distance, in the same *mean* period as the moon's. By a subsequent and similar process of inductive reasoning, he ascribes the motion of all the planets to the sun. What can be more simple, or more rational, than that the motions of the heavenly bodies and the motion of bodies at the earth's surface should all be referable to the same general laws? What could be more in accordance with the harmony which we should expect to find existent between all the works of the Great Creator? But when subsequent investigations have proved that all the complicated phenomena of *precession* and *nutation*—not *imaginary*, such as suits Mr. Bright's views—but real and actual, as known by observation—the motions of satellites round their primaries, and still more, the minute corrections of the planetary orbits due to their mutual attractions, are all most satisfactorily accounted for by this great theory—we are fully justified in stating the case between the two rival theories to be this: that there is simply no comparison between them, and that the doctrine of gravitation not only rests upon a foundation established by an inductive process of a far more satisfactory kind than that by which Mr. Bright infers the laws of distribution of "Vis," but that it gives a rational, and at the same time simple account of a vast variety of phenomena which the theory of "Vis" does not.

While the *general* explanation of planetary motions on Mr. Bright's hypothesis is of so unsatisfactory a character, it would, we repeat, be useless and unnecessary to trace the supposed part which "Vis" plays in the peculiar motions of the satellites, comets, &c. We can only assure our readers that they are of the same vague, indefinite character as those with which we have already made them acquainted; and, in at least an equal degree, militate against the established laws of mechanics.

We cannot doubt for a moment of the fate which awaits the present attempt to assimilate the laws which regulate the motions of the cosmical bodies to those which are observed in the phenomena of electricity.

It is weighed in the balances and found wanting. Mr. Bright, however, though he has certainly failed most egregiously in his attempts, both to assail the Newtonian theory and to substitute one of his own in its place, is not a contemptible writer. Apart from his peculiar theory perhaps his book may be found worthy of a perusal, as giving a brief and generally correct view of a vast number of cosmical facts, with a great many interesting quotations from some of our most valued philosophical writers. And although he has been somewhat indiscriminate in his selection of authorities, and we might take exception to his placing Professor Hunt in the same category with Sir John Herschel, Arago, and Humboldt, his evident earnestness and good faith make us not incline to be hard upon him on that score. Much, undoubtedly, if not *all*, that he has written would certainly not have proceeded from the pen of a writer who possessed a deep acquaintance with the theory of universal gravitation and with mechanical philosophy; yet his work is valuable, as indicating the kind of objections to this theory that present themselves to thinking minds not overstocked with mathematical knowledge, and of the inherent defects which we may always expect to find in a merely *popular* system of philosophy, such as Mr. Bright's undoubtedly is.

Some may be inclined to object to us, that we have bestowed more pains in the refutation of Mr. Bright's philosophical system than its inherent merits deserve. Perhaps so; but we have been induced to commit this error, if error it be, by the manifest indications that have of late appeared of a widely spread sect of heretics in philosophy, who spurn at all our great authorities, and impugn the very foundations on which our established systems rest. Possibly Mr. Bright may be their Coryphæus. If so, we do not think the space we have bestowed on the examination of his labours in vain. At all events it is time, not for the sake of truth—for truth is great and *will* prevail—but for their own sakes, that philosophers of this class should be taught, that it is not so easy to build up a rational theory consistent with itself, and with the well-ascertained laws which regulate the motion of the material world, and that notions imbibed from popular works and popular illustrations are not very safe guides in the task, either of demolishing an old, or of constructing a new theory.

EXPANSIVE MARINE ENGINES.

To the Editor of the Mechanics' Magazine.

SIR, — I perceive, referring to back *Numbers, that I have made a slight mistake.* It was Mr. Allen who gave the challenge to produce an engine as convenient as his own, and I then referred him to Craddock's. Being two months since I had forgotten the exact *status*. Of course, if Mr. Allen determines to confine himself to a partial development at low pressure of the expansive system, Mr. Craddock's engine, as I at the time stated, will not exactly meet his requirements. He is, however, mistaken in supposing they will not take up less space than his own. Moreover, some of his drawings do exhibit the arrangement for a screw, but I cannot refer to them, having lent my copy of his work for Mr. C. Wye Williams's use.

Passing these little matters, I am gratified to see the candour evinced by his examination of these important inventions. He will find some highly interesting details in Mr. Craddock's patents of a later date, especially the arrangement for saving space, weight, and cost, by rendering a single engine effective for all the purposes of a pair. A model of this plan was thought so important by the managers of the Great Exhibition of 1851, that they risked the exclusion of it from the space granted to the inventor, which space in consequence stood unoccupied during the term of the display.

Mr. Allen says rightly, that I am disposed to say anything upon anything which may draw others out to the consideration of great and important principles. It is not only useful to do so, but I take great pleasure in noticing the different kinds of attention given by different minds to such principles. A conversation on paper is much more comprehensively instructive than any private discussion can possibly be. Some men are struck silent before an important principle, some nibble at it, some evade it, or, like a bargaining Jew, praise excessively some insignificant detail to draw off attention from the main points, and some look at the facts in a straightforward manner, as in Mr. Allen's present letter. Sometimes, when those before whom important truths are brought are in the position of the silversmiths who made shrines for the great goddess Diana, more decided measures may be adopted, in the style taken by the Inquisition against Galileo, or by the College of Physicians against Harvey. They may go yet greater lengths in the spirit of the servants of those "old Popes of Rome," who burned and bullied Ridley and Latimer, for presuming to say that any truth could be found elsewhere than wrapped up in a language "not understood of the people," and in common with the old Popes' predecessors, the old Emperors, railed stoutly at the "new sect" whose "vain conceit" would turn the

world upside down, entirely forgetting the precept, "If I have done wrong bear witness of the wrong; but if not, why smitest thou me?"

It is interesting and instructive to see human passions and prejudices developing precisely the same features, in the most opposite avowed positions, teaching great lessons to those who dare stay to read them. Mr. Allen is quite right in not proposing to discuss the question of expansive steam until he considers he has accumulated correct materials. It is by going to work without materials, that the profoundest intellects the world has seen have toiled in framing baseless systems, which other profound intellects have continued to be occupied in repairing; but in vain; they have vanished like cobwebs; centuries of valuable labours have been thrown away, and the progress of true science hindered, merely for lack of beginning at the right end—*correct materials*. I should not myself care to trouble about any partial or incomplete development of the expansive system; I always like proceeding to the circumference and taking the whole sweep of a subject; but the field is very extensive even for partial adaptation. It is a credit to Mr. Allen to have selected a subject which the Dockyards have no faith in, and I wish him every success.

In reply to Mr. Truran, I *have* written much upon the subject in the *Mining Journal;* but I have never seen any of the discussions which I asked him to point out, in that and other journals. No one in reply to me has ever pointed out a single defect. Mr. Spence, of Pendleton, wrote a letter or two, arguing I set too high a value on the expansion of steam, but advanced nothing against the engines which he had never seen. Mr. Moreshead, of Liskeard, predicted that all my prognostics would be annihilated by the superior efficacy of Ericsson's caloric. These are the only two gentlemen who have had the public spirit to take up the matter openly in any shape. As to Mr. Truran's argument, that these boilers and engines would have been adopted if possessing the advantages I explained, it is evidently based on ignorance of their great merits and of the great changes their adoption would entail. The first effect would be, to entirely extinguish the present craft of boiler-making. This might not prove altogether serious, because the workmen could be applied to iron ship-building. The more serious consequence would be, a destructive inroad upon the large property invested in our highly-organised steam-engine manufactories. A change which diminishes to one-fourth the weight of machinery and boilers, and gives these small engines the same power, with a similarly fractional consumption of coal, entails an organic metamorphosis of the entire present arrangements, rendering useless patterns, tools, and a great part of the plant. It is difficult to estimate the loss of capital arising from such a change; perhaps as much might be annihilated as was paid in one year for negro emancipation. This would be the *private loss* upon a *sudden change;* the public gain in ten years after it was effected might amount to 300 millions sterling. These may seem large figures; but they are not unprecedented, as the result of savings effected by mechanical inventions. I may shortly send you some notice of an invention which, in seventy years, has earned us 700 millions, and especially given the power to draw the claws of the Russian bear. A wise and provident Government might deem it worth while to compensate private individuals, in order to obtain so enormous a public object; but this will assuredly not be done so long as the *savans* employed by the Admiralty to direct their judgment have no faith in the expansive action of steam. And there is a further difficulty in the way of this vast economy of steam-power. The skilled labour employed in our engine factories would altogether be deranged by having to apply to new details and operations. Here, again, a wise and provident Government might do something to assist in the learning. It might, perhaps, effect more good that way than in paying people to tinkle the small bell of "popular knowledge" about the country, and in erecting schools to impart idle habits, in teaching shreds of smatterings of all possible and impossible sciences. But we must take things as they are, and make the best of them. I will readily concede to Mr. Truran that there can be no reason why the Admiralty should be "indisposed" to adopt good inventions, if the persons whose advice they listen to were to point out or report their merits.

I am, Sir, yours, &c.,

DAVID MUSHET.

November 12, 1855.

BOYDELL'S TRACTION ENGINE.

To the Editor of the Mechanics' Magazine.

SIR,—I beg to thank you for your prompt attention to my last, although I hardly think you do me justice, when you say I have not "truly stated the nature of the dispute in question," believing as I do, that the proposition is fairly enunciated in my second paragraph. No doubt second questions arise, but it will be high time to discuss them when advanced. My present question, you will perceive, has nothing to

do with Boydell's engine, being confined exclusively to his wheel. At what point in B should the power P be applied to rotate the wheel with the greatest mechanical advantage apart from the axle and carriage? I readily grant, however, that what followed my proposition was wanting in many respects. I should have stated, for example, that the pulley's little *p* (referring to the diagrams) figs. 1, 2 and 3, are unconnected with the machine, or rather wheels and chain; but pulleys little *p*, fig. 4, rigidly connected. And such is our division, that a fifth figure, similar to fig. 4, with an additional pulley on the left hand side of the drum opposite the bottom one is necessary, so as to make the force lower large P act against the upper one; some saying, that in this case, the two forces P P are in equilibrium; others, that P P, fig. 4, only are so. This latter conclusion you have already justly overthrown, and if you also prove that the former are not in equilibrium you virtually settle the question in my favour; for if the two weights, P P, are equal, yet not in equilibrium, then the lever power possessed by the upper P must be either greater or less than that of lower P, supposing the action on the two pulleys below equal to that on the one above, according to the hypothesis of our opponents. In order not to mix up our present question with subsequent ones, let us suppose the axle at E removed, as can be done, according to an old patent, in which the carriage rests on the felloes, and which may yet be turned to advantage under steam culture.

I am, Sir, yours, &c.,

W. B.

London.

[We have nothing to add to our former remarks. We recommend our correspondent and his opponents to resort to well-conducted experiments in the field, (and not to models,) in order to decide the questions upon which they differ.—Ed. M. M.]

RAILWAYS AND RAILWAY CARRIAGES.

To the Editor of the Mechanics' Magazine.

Sir,—If you were not very indulgent to your numerous correspondents, and did not allow even the less practical and scientific to publish their ideas of invention in your columns, I would not as one of the less scientific venture to trouble you with some thoughts on an improvement in railways and railway carriages. I have long thought that both the carriages and rails are constructed on a principle entirely erroneous.

1st. The weight of each carriage is enormous. Heavy unwieldy structures, supported on heavier iron wheels, both of themselves forming a ponderous mass, much too heavy in proportion to the loads they usually carry. 2nd. The wear is consequently very great and most expensive, both as regards the carriages and railway. 3rd. The risk of accidents is incalculable, while the noise is deafening and the motion disagreeable. Here I have under three heads summed up the unnecessary evils connected with our present mode of railway travelling. Though I am not a practical engineer, I am by nature fond of the science, and therefore trust the scientific men will pardon me, if I offer ideas which, in my ignorance, I consider of some value.

However admirable and swift railway travelling may be, yet no one will deny, looking at a train as it passes by, that there is something very clumsy about the whole contrivance of the carriage; and you cannot help feeling impressed with the idea that some accident must happen. This is not the case with a steamer at sea, even in a moderate storm: there every thing is elegant, and you do not feel in constant dread. Now, I would ask, with all due submission to the engineering skill of this country, why we should still be subject to the terrors of railway travelling, when its dangers may be so easily avoided? On the simple principle I am about to lay down: 1st. The noise would be but little; 2nd. The carriages might be made of the lightest material; 3rd. The carriages could never slip off the line; 4th. The wear would be very trifling when compared to the present system.

It appears to be thought, that because the old stage coach had wheels, railway carriages must necessarily have them too. This I contend is a great mistake; my plan is altogether to do away with wheels to the carriage. I propose (and leave engineers, should my idea be correct, to work it out), that the engine, as at present, should be supplied with wheels, and run on a rail as usual, but that the carriages of a very light construction should move over rollers fixed on the railway at proper distances. In this way you would have an engine drawing behind it a weight incomparably lighter, moving continually on a rolling or revolving body, firmly fixed and level—as it were a continuous revolving plane. I throw out these suggestions, hoping, if there be any good in them, that engineers may work out the problem, whether a carriage with wheels attached to it, meets with a less resistance than a carriage without wheels moving over fixed rollers revolving on their own axes?

I am, Sir, yours, &c.,

J. J. Lockhart.

Stonebridge-place, Dalston,
October 31, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

ARRIVE, PETER, engineer, of Spencer-street, Darnley-road, Gravesend, Kent. *Improvements in safety-valves of steam boilers.* Patent dated April 5, 1855. (No. 766.)

This specification has several claims in the style of the following, which is the first. "The pile seating of rings, being the marginal annular rings, which seat the valve-lid preferably having conformation to become compressed under steam upon the annular margin of top of valve-box," &c.

DURANT, ANGUISH HONOUR AUGUSTUS, Esquire, of Tong Castle, Salop. *An improved axle and axle-box for carriage wheels, shafts, axles, or general bearing of machinery.* Patent dated April 5, 1855. (No. 767.)

The inventor, in order to reduce friction, cuts broad grooves in one of the rubbing surfaces, and at the bottom of these grooves cuts a fine helical or spiral groove along which the oil or lubricating matter is carried, and is then deposited at or near the working surfaces, the said lubricating matter being supplied from a reservoir at or near the end of the axle or axle-box.

WAITHMAN, ROBERT WILLIAM, Esquire, of Bentham House, York. *Improvements in machinery or apparatus for the manufacture of lint or similar substances.* Patent dated April 7, 1855. (No. 768.)

Claims.—1. Certain improved methods of imparting to the knife and cushion or bed upon which it presses a combined to-and-fro motion by means of cams or other similar contrivances. 2. Constructing the cushion or bed of a series of adjustable springs contiguous to each other, fixed laterally upon a suitable framing with an upper surface of leather or other suitable material.

HAYS, WILLIAM BENNETT, of Cambridge-street, Pimlico, Middlesex, civil engineer. *An improved breakwater.* Patent dated April 7, 1855. (No. 769.)

The inventor constructs his breakwater by placing platforms one over the other, with intervals between them, and so inclined to the horizon as to present the lower part of each platform to the sea, and to cause the water when in motion to pass between the platforms in a sloping upward direction.

ROLLASON, ALEXANDER, of Birmingham, Warwick, photographic artist. *Certain improvements in photography.* Patent dated April 7, 1855. (No. 770.)

A full description of this invention will shortly appear.

STONES, RICHARD, of Kingston-upon-Hull, York, brass-founder. *Improvements in taps or cocks for drawing off fluids.* Patent dated April 7, 1855. (No. 772.)

This invention mainly consists in the substitution for the ordinary plug of a cone, button, or disc valve, such valve being acted upon or opened by the turning of a T-headed or other form of spindle in the place of the ordinary plug, such spindle having an elliptic collar, the major axis of which is considerably greater than the minor axis.

HULL, JOSEPH, of Liverpool, Lancaster. *Improvements in the machinery and apparatus for grinding corn.* Patent dated April 7, 1855. (No. 773.)

This invention relates—1. To a novel mode of setting out and working the furrows in the grinding faces of mill-stones. 2. To exhausting the heated air from around and between the stones so worked, by means of a suitable fan or exhauster, in order to keep the stones cool.

ARESTI, JOSEPH, of Greek-street, Soho-square, Middlesex, lithographer. *A method of obtaining improved effects upon drawings washed or painted on stone.* Patent dated April 7, 1855. (No. 774.)

This invention consists "in the application of a series of light graduated stripples or dots upon the surface of a drawing, washed either directly upon the stone, similar to the usual Indian ink or coloured drawings upon paper, or transferred from paper upon the stone, or executed with the stump; such application, by protecting the tints of the drawing during the process of the requisite acidulation, enabling it to be printed by the usual lithographic methods."

TUER, WILLIAM, WILLIAM HODGSON, and ROBERT HALL, machine-makers, and SAMUEL HALL, foreman, all of Bury, Lancaster. *Certain improvements in looms for weaving.* Patent dated April 9, 1855. (No. 779.)

Claim.—Giving motion to the tappets by which the drop boxes of looms are raised or lowered by means of a chain and star or spur wheels.

O'CALLAGHAN, EDWARD, Lieutenant of H. M.'s fifty-first Light Infantry. *Improvements in ordnance, and in projectiles applicable to ordnance and small arms.* Patent dated April 9, 1855. (No. 780.)

This invention consists—1. In so adapting the elevating screw and nut of guns that the breech end of the gun may be brought on a level with, or pass below, the said nut. 2. Constructing projectiles upon the expanding principle with receptacles for explosive compounds capable of being fired by percussion.

COPE, DAVID, of Birmingham, Warwick, manufacturer. *Improvements in the manufacture of metallic spoons, forks, and ladles.* Patent dated April 9, 1855. (No. 781.)

This invention consists—1. In rolling sheet metal of a greater thickness at or near

its middle than at its edges, so that that portion of the metal from which the stems of the spoons, forks, and ladles are cut shall be of a greater thickness than the parts from which the bowls, prongs, and handles are cut. 2. In cutting out the blanks, and shaping the articles in one operation.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Improvements in pumps.* (A communication.) Patent dated April 9, 1855. (No. 783.)

This invention consists in "the combination of an air chamber communicating with the pump above all the valves, with a vacuum chamber communicating with the pump below all the valves."

RICKETTS, WILLIAM, and THOMAS BULLEY, of Stepney, Middlesex, painters and grainers. *Improvements in producing ornamental designs on painted or japanned table-covers.* Patent dated April 10, 1855. (No. 784.)

This invention consists in "producing patterns of marbles and of various materials arranged as imitations of inlaid work, composed of marbles and woods, together or separately, on japanned or painted moleskin, canvas, and similar fabrics, having suitably prepared surfaces for table and other like covers."

FIELDING, SAMUEL, the younger, of Green, Rochdale, Lancaster. *Improvements in apparatus for oiling or lubricating the pistons of steam engines.* Patent dated April 10, 1855. (No. 785.)

Upon the air-pump rod of a steam engine is fixed a tappet which (at each stroke of the engine) comes into contact with a lever, having at the other end thereof a catch, which acts upon a ratchet wheel at one end of a small shaft. Upon this shaft is a worm actuating a worm wheel, attached to or upon the face of which is keyed a snail which acts upon the piston of the oiling machine. The piston draws the oil from a cup, and forces it into a small reservoir, whence it flows along a tube passing through the cylinder cover. This tube is provided with a small upright air valve, and a stop-cock for shutting off the supply of oil when the engine is not working, and also for regulating the quantity supplied. The said pipe communicates with another tube, which is attached to the piston and communicates with the interior of the rings or packing of it. This last tube moves up and down with the piston, and slides in a tubular case attached to the cylinder cover, so that at each downward stroke of the piston the oil is admitted to the interior of the packing.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Certain improvements in the construction of steam boilers.* (A communication.) Patent dated April 10, 1855. (No. 786.)

This invention consists in the employment of one or two heating chambers, surmounted by one or more steam boilers, the latter being fitted with metallic diaphragms for enlarging the heating surface.

CHAPLIN, ALEXANDER, of Glasgow, Lanark, engineer. *Improvements in steam boilers, and in the combustion of fuel.* Patent dated April 10, 1855. (No. 787.)

Claims.—1. A general arrangement of boilers and furnaces. 2. A mode of constructing steam boilers with tapered flue tubes, arranged vertically, with their wider ends next the fire, and fixed in their tube plates by means of nuts screwed upon their smaller ends. 3. A mode of developing and utilising heat in steam boiler and other furnaces, by forcing in a supply of atmospheric air beneath the fire, and by retarding the egress of the heated gases by means of a damper or other suitable contrivance.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for combing wool and other fibrous substances.* (A communication.) Patent dated April 10, 1855. (No. 788.)

According to this invention, the fibrous material is combed by a simple drawing action, in place of the action of comb teeth inserted into the fibres, and then drawn out repeatedly whilst the wool is held in the teeth of a fixed comb, or between a pair of nippers.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for preparing cotton and other fibrous substances.* (A communication.) Patent dated April 10, 1855. (No. 789.)

This invention relates to the slubbing and roving processes. In it the slivers or filaments are wound on to a spindle in rings or coils of uniform diameter laid one over the other, each ring or coil covering a portion of the preceding rings or coils, and these successive rings are wound eccentrically around a common centre or spindle, &c.

MONZANI, LOUISA, widow and administratrix of Willoughby Theobald Monzani, late of St. James's-terrace, Blue Anchor-road, Bermondsey, gentleman, deceased. *Improvements in folding-stools and folding-chairs.* (A communication.) Patent dated April 10, 1855. (No. 790.)

In making stools according to this invention, the canvas or other seating is so connected with the frame, that as the former is wound or unwound from the bar connecting the frames, the height of the stool is increased or diminished.

BEAUCLERK, LORD CHARLES, of the Riding, Northumberland. *Improvements in machinery for tilling and subsoil ploughing.* Patent dated April 10, 1855. (No. 871.)

This invention consists in the use of axes, with inclined or screw-formed cutting blades thereon, such axes, on the blades being drawn on or under the surface of the land, having rotatory motion imparted to them by means of these blades.

BLUNT, CHARLES, of Wanstead, Essex, gentleman, and JOSEPH JOHN WILLIAM WATSON, of Wandsworth, Surrey, doctor of philosophy. *Improvements in the composition of artificial fuel, with the machinery employed in the manufacture thereof.* Patent dated April 11, 1855. (No. 794.)

This invention relates to modifications of a former patent of the inventors, dated August 22, 1854. See *Mech. Mag.*, vol lxii., p. 257, No. 1649.

OUDRY, LEOPOLD, electro-metallurgist, and ALPHONSE OUDRY, Imperial Government engineer, both of Paris, France. *Certain improvements in preserving wood, metal, and other substances.* Patent dated April 11, 1855. (No. 795.)

Claims.—1. The covering of articles of cast or sheet iron with a layer of metal to protect them from destruction. 2. The application of electro-metallurgy to covering the wooden hulls of vessels, and the wood-work for gates of sluices, jetties, and reservoirs. 3. "The partial application of a thick layer of zinc, by means of electricity, upon non-zincked rivets uniting pieces zincked in a bath of molten zinc."

ALDERMAN, JOHN, of Denmark-street, Middlesex, manufacturer. *Improvements in the construction of adjustable couches, chairs, and other similar descriptions of furniture for invalids.* Patent dated April 11, 1855. (No. 796.)

These improvements consist in attaching to the lower frame of such articles of furniture a rising frame divided into two or more portions, connected by joints or hinges, and worked by means of screws and nuts, in such manner that either of the said portions may be gradually elevated or depressed as it is desired to raise or lower any parts of an invalid or a body to be operated on.

FLETCHER, JAMES, of Facit, near Rochdale, Lancaster, manager. *Improvements in and applicable to machines for spinning and weaving cotton, wool, and other fibrous materials.* Patent dated April 11, 1855. (No. 797.)

This invention relates first to mules, and consists in substituting a comb or an equivalent arrangement in place of the wire of the counter faller, so as to form a division between the threads which pass into the spaces, or between the teeth of the comb, so that when a thread breaks it will be prevented from lashing up on the other threads as it is drawn on to the spindle. It relates, secondly, to power-looms, and consists in a modification of the strap used to break the force of the picker.

DOPTER, JEAN VINCENT MARIE, of Paris, France. *Certain improvements in printing fabrics.* Patent dated April 11, 1855. (No. 799.)

This invention relates "to the application of the ordinary printing colours, which are reduced into powder; to the printing and tracing off or counter-drawing on any kind of fabrics by lithography, chromo-lithography, zincography, copper-plate engraving, and typography, and also by all the modes of printing that are carried on in different colours with fatty or glutinous substances that can be reduced to powder."

HOLT, SAMUEL, of Shaw-heath, Stockport, Chester, manager. *Improvements in weaving plush or piled fabrics.* Patent dated April 11, 1855. (No. 801.)

These improvements consist "of a peculiar combination of the mechanical parts of the machinery employed when weaving two pieces of plush or piled fabrics face to face, which are cut apart (by a traversing knife actuated by the working of the machinery) as fast as the fabrics are woven."

WILSON, GEORGE FERGUSSON, CONRAD ABBEN HANSON, and JAMES JOHN WALLIS, all of Belmont, Vauxhall. *Improvements in the manufacture of lamp-candles, and in candle-lamps for holding the same.* Patent dated April 11, 1855. (No. 802.)

This invention consists in making a candle in a mould, having therein a suitable wick or wicks which will bend out of the flame when burning, such candle being of a greater weight than 2 oz., and not of a greater length than two of its diameters; and in making candle tubes to hold the same.

DEVY, PHILIPPE AMEDEE, of Old Jewry-chambers, Old Jewry. *Improvements in the construction of coke ovens.* (A communication.) Patent dated April 11, 1855. (No. 803.)

This invention has for its object a peculiar construction of coke oven, with a view constantly to carry on the process of coke-making, partly by the aid of external heat applied to the mass of a coke oven, by the ignited products which pass off from the coal in the oven, and by introducing air at an opening or openings over the charging door.

WILSON, GEORGE FERGUSSON, and GEORGE PAYNE, of Belmont, Vauxhall, *An improvement in ornamenting glass.* Patent dated April 11, 1855. (No. 804.)

This invention consists in crystallizing fatty acids on the surface of glass, or between two surfaces of glass.

NORTON, JAMES LEE, of Holland-street, Blackfriars. *Improvements in separating*

wool and other animal fibres from vegetable matters, and in drying wool and other animal fibres. Patent dated April 11, 1855. (No. 805.)

This invention consists in first cleansing the vegetable matters from grease and dirt, then steeping them in dilute sulphuric acid, then extracting the superfluous acid liquor from the wool or animal fibre by means of a hydro-extractor or centrifugal machine, and afterwards gradually drying it, and steaming it in a close steam box under pressure until the vegetable matter is destroyed.

RICHARDSON, ALFRED THOMAS, manufacturer, and GEORGE MALLINSON, pattern designer, both of Manchester. *Improvements in the manufacture of certain piled fabrics.* Patent dated April 12, 1855. (No. 809.)

Claim.—The manufacture of fabrics by floating woollen, worsted, mohair, or alpaca weft threads over the warp threads, in such wise that the floats of weft overlap each other, and form races which, when cut, form the pile of the fabrics.

VERNON, ISAIAH, of West Bromwich, Stafford, manufacturer. *An improvement or improvements in the slide valves of steam engines.* Patent dated April 12, 1855. (No. 811.)

This invention consists in causing slide valves to work between the bed or seat and a plate or detached back, the latter pressing the valve to its bed or seat by the action of the steam upon a piston connected with the plate or back.

TERRY, WILLIAM, of Francis-street, Aston, Birmingham, Warwick, gun-maker. *Improvements appertaining to breech-loading fire-arms.* Patent dated April 12, 1855. (No. 812.)

This invention consists mainly in an extension of the principle of Brand's patent, dated August 11, 1853, and in the employment of suitable bullets and cartridges.

CUNNINGHAME, ALEXANDER, of Glasgow, Lanark, ironmaster. *Improvements in the manufacture or production of sulphuric acid and sulphates of iron and alumina.* Patent dated April 12, 1855. (No. 813.)

This invention mainly consists in a mode of manufacturing sulphuric acid, and the sulphates of iron and alumina, by reducing alum, schist, or other minerals, and converting them into masses for treatment by heat.

LALEMAN, JULES, of Lille, France, of the firm of Canyn and Company. *Improved machinery for combing flax and other similar fibrous materials.* (A communication.) Patent dated April 12, 1855. (No. 814.)

The inventor employs a pair of nipping or holding rollers, which, as the stricks of flax are brought down to be acted upon by the comb-cylinder or cylinders, will feed it gradually thereto, and at the same time hold it so firmly as to prevent the comb-cylinder from drawing the fibres out of the grip of the holding rollers. By the use of these rollers he is enabled to employ a chain of pendent combs in lieu of the ordinary clamp holders.

BAGARY, JEAN BAPTISTE, and CLAUDE PERRON, of Paris, France. *New or improved knitting machinery.* Patent dated April 13, 1855. (No. 815.)

"This invention relates," say the inventors, "to a new system of machinery for forming knit goods with two threads, which are commonly called fabrics, with turned round meshes; these fabrics being now generally manufactured by manually turning round the fabric after the formation of each row of loops on opposite sides alternately."

TEMPLETON, JAMES, of Glasgow, Lanark, manufacturer. *Improvements in the manufacture of pile fabrics.* Patent dated April 13, 1855. (No. 816.)

This invention relates to the manufacture of figured pile or velvet fabrics, such as carpets, rugs, and table covers, from what is technically known as "fur pile," or "chenille" material, the fur being used, not as a weft, but as a warp.

WIMPENNY, THOMAS, of Holmfirth, York, manufacturer, and JONAS WIMPENNY, of Rawtenstall, Lancaster, surgeon. *Certain improvements in machinery or apparatus for drawing and spinning wool, or wool mixed with other fibrous substances.* Patent dated April 13, 1855. (No. 819.)

This improvement consists in passing "the carding" (upon its leaving the delivery rollers) through a pair of fluted drawing rollers, enclosed in a circular box or case, caused to revolve in an opposite direction to each other by means of a small spur pinion connected with a worm and worm-wheel inside of, or attached to one of the fluted rollers. The case or box is driven like an ordinary pulley, with a band or cord passing round its periphery. The carding is passed in at one side of the case, between the fluted rollers, and out at the other side, and thence direct through a flyer on to the spindle, as in a common "throstle." "Rotary motion being imparted to the circular case or box, it will cause the fluted drawing rollers therein to revolve at a greater speed than the delivery rollers, and thus draw the carding down to any degree of fineness; while, at the same time, (being held firmly between the fluted drawing rollers and the delivering rollers,) it then will be spun or twisted."

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent-agent.

Improvements in the treatment of fatty and resinous matters, and in preparing them for the manufacture of candles and other articles. (A communication.) Patent dated April 13, 1855. (No. 821.)

Claims.—1. The purification of fatty and resinous bodies by the employment of oxygenated muriatic acid and of oxygen gas, as described. 2. The separation of the fluid from the solid parts of oily and fatty bodies by means of azoted hydrogen gas, as described. 3. The solidification of fatty and resinous bodies by chloride of calcium, as described. 4. The transformation of oily and soft fatty bodies into hard or waxy bodies by dissolving them, or by means of alcohol, ether, or essential oils, as described. 5. The production, from fatty and oily bodies, of an oil not affected by any ordinary changes of temperature. 6. The production of sulphate of alumina, sulphate of soda, sulphate of potash, and other salts, by the crystalization of the mother waters, when metallic oxydes are employed. 7. The preparation of resin, in order to adapt it to the manufacture of candles and production of ether, as described.

Hill, Thomas, of Walsall, merchant. *Improvements in the manufacture of horse-shoe and other nails.* (A communication.) Patent dated April 13, 1855. (No. 822.)

Claim.—"Producing horse-shoe nails or other nails, having the head projecting on more than two sides, or on two sides at right angles to or not opposite each other, from plate iron or other plate metal, by first rolling out the plate to produce the profile or longitudinal sectional form which the nail is required to have in one direction, and then cutting the said plate by a punch and die, or other suitable cutting apparatus, in a perpendicular direction."

Turner, George, of Northfleet, Kent. *Certain improvements in the construction and fitting of tents and marquees.* Patent dated April 13, 1855. (No. 823.)

The uprights or supports for tents and marquees consist, according to this invention, of pipes or tubes, each supported by three or more legs. A fire-place or cooking apparatus may be fitted below the tubular upright or support, so that the latter may act as a chimney, or the fire-place may form the base of the upright or support, and the legs be dispensed with.

Sculfort, Gustave Irenée, of Maubeuge, France, manufacturer. *An improvement in screw wrenches.* Patent dated April 14, 1855. (No. 830.)

Claim.—The combination of a circular screw stock with two, three, or more dies, held and guided to the centre by several described methods.

Fontainemoreau, Peter Armand Lecomte de, of South-street, London. *Improvements in the production of a felted tissue, applicable to replacing leather in the manufacture of cards.* (A communication.) Patent dated April 16, 1855. (No. 831.)

This invention consists in a mode of weaving a felted tissue, by combining wool with linen, cotton, hemp, or other suitable substance, of a sufficient strength to serve as a substitute for leather, particularly in its application to the manufacture of carding cards, driving straps, &c.

Bentall, Edward Hammond, of Heybridge, Essex, ironfounder. *An improvement in the construction of harrows.* Patent dated April 16, 1855. (No. 835.)

The inventor punches square or rectangular socket holes in the beams, for the purpose of receiving the squared or angular parts of the stems of the harrow teeth or tines; and through the cross bars he punches round holes, through which the threaded end of the tine projects, to receive a nut as usual. When the nut is screwed up tight, it is secured in its place by riveting or otherwise securing to the bar an abutting piece, which fits against the side of the nut, and prevents it turning, the tine itself being prevented by the hole in the beam.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Kay, James Clarkson, of Bury, Lancaster, engineer. *Improvements in the construction of pressure and vacuum gauges.* Application dated April 9, 1855. (No. 778.)

These improvements consist in planing or otherwise forming grooves in plates in such manner that accuracy is secured; and in covering these grooves with metal, glass, or other material, so as to complete the gauge, and exhibit the pressure or vacuum.

Bull, William, of Ramsey, Essex, clerk. *An improved instrument for cutting or slicing turnips and other vegetables.* Application dated April 9, 1855. (No. 782.)

"My invention consists," says the inventor, "in mounting upon a circular disc spirally a series of small blades or studs with cutting edges, as also a long fixed slicing-blade, which extends from the centre to the edge of the disc. There is also a fixed edge or blade. The action of the instrument is as follows:—Upon any vegetables, say turnips, being fed into or held against the machine, and the disc being caused to rotate, the turnips are first divided by the spiral cutters into small pieces, and are afterwards sliced by the long slicing blade, and fall out from the machine through an aperture or slot made in the face of the disc just behind the fixed slicing-blade."

Edge, Jonathan, of Bolton-le-Moors, Lancaster, engineer. *Improvements in steam*

engines. Application dated April 11, 1855. (No. 792.)

This invention consists in forming a vacuum under or above both the pistons of a compound engine.

ADDISON, JOHN, of Basinghall-street, London, captain H. E. I. Company's service, and DUNCAN SINCLAIR, of Oxford-street, Middlesex, gentleman. *Improvements in the manufacture of bayonet-scabbards, sword-scabbards, pistol-cases, and holsters.* Application dated April 11, 1855. (No. 793.)

Instead of using leather for the above purpose, the inventors make use of gutta percha, which enables them to manufacture the above articles without a seam.

HEMMING, FREDERICK SHAND, of Birkenhead, Chester, engineer. *Improvements in the construction of buildings, which improvements are particularly applicable to military and other hospitals.* Application dated April 11, 1855. (No. 798.)

The inventor proposes to line the walls of buildings with a material which possesses the property of absorbing noxious and deleterious effluvia. The non-conducting and absorbent material which he prefers employing is peat charcoal, but any other suitable solid deodorizing agent may be used.

WILHELMY, FERDINAND, engineer, of Dusseldorf, Prussia. *Border paddles for steam-boat wheels.* Application dated April 12, 1855. (No, 810.)

"This invention consists," says the inventor, "in providing the paddles of steamboat wheels with borders adapted to both sides of the paddles; in modifying these paddles, by substituting on both long sides a concave surface instead of a level one; and in applying two borders to their short sides."

WEALLENS, WILLIAM, of Elswick Villas, Newcastle-on-Tyne, mechanical engineer, and GEORGE ARTHUR CROW, of Forth-street, Newcastle-on-Tyne, mechanical engineer. *Improvements in marine steam engines.* Application dated April 13, 1855. (No. 817.)

This invention consists in taking the piston-rods of a marine engine direct to the air-pumps, and passing them through the same, "the working power or force of the engine being brought back," say the inventors, "by any of the ordinary and well known mechanical arrangements to the cranks which with the main shaft are placed between the cylinders and air-pumps."

REVELL, JOSEPH, of Dukinfield, Chester, plasterer. *Certain improvements in machinery or apparatus for propelling vessels.* Application dated April 13, 1855. (No. 818.)

This invention consists in maintaining a parallel motion of all the floats of a paddle-wheel throughout its entire revolution, by employing two or more rings of metal (which support the floats) revolving in the same plane, but having different centres.

JARMAN, JOHN, of Masborough, York. *Improvements in horse-shoes.* Application dated April 13, 1855. (No. 820.)

The inventor forms the toe and a portion of one or both sides of the shoe of one piece of metal, and the remaining portions of the side or sides of bars of metal, and connects the two parts by means of a peculiar description of mortise joint.

DENOUAL, JULAS, of Samares Lodge, St. Clement's, Jersey. *Certain improved means of enveloping medicinal preparations with soluble substances.* Application dated April 14, 1855. (No. 824.)

The inventor proposes to coat pills with a compound formed of gelatine, loaf sugar, gum arabic, and water.

ARMSTRONG, JOSEPH, of the Normanton Station, Wakefield, and JOHN LIVINGSTON, of Leeds. *Improvements in certain parts of the permanent way of railways.* Application dated April 14, 1855. (No. 825.)

This invention consists in employing certain sliding rails in connection with railway crossings.

GOSSAGE, WILLIAM, of Widnes, Lancaster, chemist. *Improvements in the manufacture of certain kinds of soap.* Application dated April 14, 1855. (No. 826.)

This invention consists of certain modifications of the previous patents of Mr. Gossage, dated respectively April 3, 1854, and August 3, 1854.

HERBERT, JANE ANN, of Waterden-place, Guildford, Surrey, widow. *Improvements in propellers for vessels, which are denominated the conical propellers.* (A communication.) Application dated April 14, 1855. (No. 827.)

This invention consists in employing two wheels or disks, or their equivalents, with or without arms, so constructed and set that their axes stand at about 120° from each other, and that their peripheries touch each other, or nearly so, at one point, while their faces diverge.

REID, WILLIAM, of Holehouse, Neilston, Renfrew, bleacher. *Improvements in the treatment, cleaning, starching, and finishing of textile fabrics.* Application dated April 14, 1855. (No. 828.)

In the washing of shirts, &c., according to this invention, the goods are deposited in dash-wheels of the usual kind or in similar apparatus, but instead of the supply and discharge apparatus being left open as at present, they are fitted with doors, small perforations being made in the latter (or in such other part of the containing chamber

as may be advisable), for the entry of atmospheric air. The washing liquid is well heated by steam pipes or other heater prior to being passed into the dash-wheels. The starching chambers, into which the goods are next passed, is also heated, and the finishing also effected by means of steam, &c.

KENNEDY, THOMAS, of Kilmarnock, Ayr, gun-manufacturer. *Improvements in shot or projectiles.* Application dated April 14, 1855. (No. 829.)

In carrying out this invention with cylindro-conoidal shot, the cylindrical portion forming the after part of the projectile is made hollow, for the purpose of receiving a series of moveable feather pieces, which are arranged to be pressed through or into longitudinal slots by a piece of caoutchouc or other elastic material also contained in the hollow of the projectile.

ORDISH, ROWLAND MASON, of Copenhagen, Denmark, engineer. *Certain improvements in the permanent way of railways.* Application dated April 16, 1855. (No. 832.)

This invention consists "in constructing bridge rails with their flanges bent down into a perpendicular or inclined position at the intermediate parts. The strength is further increased by rolling the rails with a beading or thick edge to each flange."

HUSBAND, RICHARD, of Manchester, Lancaster, hat manufacturer. *Certain improvements in the manufacture of hat-plushes of spun silk and other spun yarns.* Application dated April 16, 1855. (No. 833.)

These improvements are effected by producing a pile "by cutting instead of raising."

HOLMES, HENRY, of Clifton-road, Maida-vale, Middlesex, doctor of medicine and surgeon. *Certain processes of treating the human body by gases, vapours, and electricity, and for certain apparatus for obtaining and applying the said gases, vapours, and electricity, to the above or any other purposes.* Application dated April 16, 1855. (No. 834.)

This invention consists—1. In treating the human body by immersions in any gases or vapours possessing a medicinal or agreeable influence when imbibed through the pores of the skin, or otherwise, while the electrical condition of the body is, if necessary, suitably modified; and—2. In an apparatus to be called the pneumatic bath, in connection with, and by means of which, the said gases, vapours, and electricity may be obtained and subsequently applied.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Certain improved machinery for manufacturing nails, bolts, rivets, and other similar articles.* (A communication.) Application dated April 17, 1855. (No. 840.)

The inventor employs a compressing box, in which the bolts receive a rough shape before entering into the working box to be finished; a beam, put in motion by a connecting rod, and forcing the lid of the box close; a cutter, the lower end of which is fixed on a frame, the upper part descending to cut the bars after they have been compressed; and a working box, into which the bars are pushed after the cutting operation, and in which the bolts are finished.

CLAPHAM, ROBERT CALVERT, of Ardrossan, Ayr, analytical chemist. *Improvements in the manufacture or production of the salts of baryta and of artificial iron pyrites, and in the application thereof in the manufacture or production of salts of soda or other alkaline salts.* Application dated April 17, 1855. (No. 847.)

In carrying out this invention sulphate of baryta, carbonaceous matter, oxide of iron, and any suitable flux (carbonate of soda or common salt for example) are together subjected to the action of heat in any convenient manner. The fluxed mass so produced is then lixiviated in water, and the products obtained are caustic baryta in solution and sulphuret of iron as a residue. These articles may then be applied in the following manner:—The sulphuret of iron is either burnt to produce sulphuric acid, or the decomposition of common salt is directly effected by it, according to any convenient method, so as to produce sulphate of soda and oxide of iron. The sulphate of soda in solution is then subjected to decomposition by the action of a solution of caustic baryta producing caustic soda and sulphate of baryta. The caustic soda is treated in the ordinary or other convenient manner for the production of the finished article, whilst the sulphate of baryta and the oxide of iron are reapplied for the purpose before referred to.

PROVISIONAL PROTECTIONS.

Dated October 22, 1855.

2358. William Teall, of Wakefield, York, engineer. A mode of treating certain materials containing fatty or oily substances, in order to extract those fatty or oily substances therefrom.

2360. Alexander M'Glashan and Edward Field, of the Coal-yard, Drury-lane, London, engineers. Improvements in printing-presses.

Dated October 23, 1855.

2366. Alfred Gregory, of Church-street, Surrey, plumber, and John Jillings, of Temple-street, Whitefriars, London. Improvements in cleansing the basin or pan of waterclosets, and in apparatus for the same.

2368. George Collier, William Bailey, and Richard Horsfall, of Halifax, York. Improvements in drying wool and other fibrous substances.

2370. Thomas Roberts and John Dale, of Manchester, manufacturing chemists. Certain improvements in treating and preparing amylecious substances for the purpose of stiffening.

2372. William Shears, of Bankside, Southwark. An improvement in cases or magazines for gunpowder or other explosive preparations or compounds.

2374. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in machinery for making rope and cordage. A communication.

Dated October 24, 1855.

2376. John Bevan, of High-street, Deptford, Kent, gentleman. Improvements in projectiles.

2378. John Healey, engineer, and John Foster and John Lowe, spindle-makers, of Bolton-le-Moors, Lancaster. Improvements in machinery to be used for drawing, moulding, forming, and forging various articles of metal.

2380. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the production of dies and matrices partly applicable to the production of printing surfaces. A communication from M. Beslay.

2382. Ellis Butterworth, of Rochdale, Lancaster, machinist. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton, wool, and other fibrous materials.

2384. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in churns. A communication.

Dated October 25, 1855.

2386. Alfred Ardouin, of Woodland-street, East Greenwich, Kent, shipwright and carpenter. A corking and capsuling-machine.

2388. Edward Daniel Johnson, of Wilmington-square, Middlesex, watch-manufacturer. Improved apparatus for tuning stringed instruments.

2390. Joseph Robinson, of Aldersgate-street, watch-maker, in the employ of William Mott, of Cheapside, London. Certain improvements in winding clocks.

Dated October 26, 1855.

2392. Thomas Beatt Sharp, of Manchester, engineer, and Richard Furnival, of the same place, foreman. Certain improvements in machinery for drilling, grooving, and slotting.

2394. Frederick Crace Calvert, of Manchester, Lancaster, professor of chemistry. Improvements in the treatment of copper slags, scoriæ, or cinders, so as to obtain the iron which they contain.

Dated October 27, 1855.

2396. Joseph Charles Frederick, Baron de Kleinsorgen, of Sidmouth-street, Middlesex. An improved variation and azimuth compass.

2400. John Davie Morries Stirling, of Blackgrange, Clackmannan. Improvements in the manufacture of cast steel tubes and cylinders, applicable especially in the manufacture of cannon, mortars, and other guns, also steam and other cylinders.

2402. George Geyelin, of Melville-terrace, Camden-road, Middlesex, civil engineer. An improved construction of perambulator.

2404. Joseph Hands, of Duke-street, Grosvenor-square, Middlesex, M.R.C.S. Improvements in preserving animal and vegetable substances for food.

2406. John James Speed, jun., of Detroit, Michigan, United States. Improvements in car and carriage-springs.

Dated October 29, 1855.

2408. George Riley, of Portland-place North, Clapham-road, Surrey. An improved roller-mill for grinding malt.

2410. Joseph Whitworth, of Manchester, Lancaster, engineer. Improvements in artillery and fire-arms.

2412. Léon Roudière, of Paris, Empire of France. An improvement in boots for cavalry.

2414. William Hartley, of Bury, Lancaster, engineer. Improvements in safety-valves.

Dated October 30, 1855.

2418. William Cartwright Holmes, of Huddersfield, York, gas-engineer. Improvements in steam boilers, and in the mode or method of preparing or generating steam, and in the apparatus connected therewith.

2420. Joseph Barrans, of Deptford, Kent, engineer. Improvements in steam-boiler furnaces.

2422. Jules Jean Baptiste Sylvain Martin de Lignac, gentleman, of Paris, France. An improved mode of preserving animal substances.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2442. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in sewing-machines. A communication. November 1.

2454. John Lewis, of Dawley Green, Salop, and Joseph Edwards, of Dawley, stone mason. Improvements in malt-crushers. November 2.

2479. William Henry Walenn, of Regent-street, Middlesex, civil engineer. An improved mode of flattening cylinder glass. A communication from William Penn Walter, of Philadelphia, United States. November 5.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November* 13*th*, 1855.)

1494. William Henry Tooth. Certain improvements in the machinery for and in the manufacture of earthenware and plastic articles, and in the preparation of clays and other materials.

1500. George Guillaume. Certain improvements in machinery for communicating power to the wheel or axle of steam or other engines, or for carriages to be propelled by hand or foot.

1501. George Antoine Tabourin. A new system of metallic arch proper for the construction of bridges, arcades, vaults, roofs, and all other such purposes.

1509. Samuel Oddy. Improvements in constructing and lubricating the bearings of mule spindles.

1518. Anguish Honour Augustus Durant. An improvement in extracting castor oil.

1529. Ezra Washington Burrows. Improvements in machinery adapted for increasing the efficiency of steam engine and other power.

1530. Richard Roberts and George Coppock. Certain improvements in looms for weaving.

1536. John and Anton Bruno Seithen. Improvements in machinery for cutting and shaping cork.

1539. James Palmer. Improvements in machinery for carding cotton and other fibrous substances.

1553. Julius Jeffreys. Improvements in steam boilers.

1554. John Adams. Improvements for indicating the time when persons commence and leave their work or calling.

1559. John Bethell. Improvements in preserving meat, fish, fruits, and other eatables from decay, and for the purpose of their being used as provisions.

1568. Thomas Redmayne. Improvements in stove grates.

1585. Francis Hamilton. Improvements in adjusting the top cards or flats of certain carding engines.

1606. Henry Huthnance. An improved method of effecting the combustion of coals, as used in the production of heat.

1627. James Gray Lawrie. Improvements in steam engines.
1628. Piétro Bertinetti. A new safety projectile.
1633. John Henry Johnson. Improvements in transmitting motive power, principally applicable to horse-mills. A communication.
1635. John Henry Johnson. Improvements in the manufacture of reeds for weaving, and in the machinery or apparatus employed therein. A communication.
1663. Charles Goodyear. Improvements in the manufacture of wheels for carriages and other vehicles where India-rubber is used.
1665. Charles Goodyear. Improvements in bands or straps for confining or holding papers or documents and other articles where India-rubber is used.
1703. Charles Goodyear. An improvement in the manufacture of gunpowder. A communication.
1705. William Mardan. An improvement in treating garancine. A communication.
1725. Charles Goodyear. Improvements in manufacturing covers for floors when compounds of India-rubber are used.
1729. William Fletcher Coles. An improvement in the manufacture of boots and shoes.
1785. Samuel Cunliffe Lister. Improvements in hackling, combing, and treating flax, wool, and other fibrous material, before being spun.
2141. Etienne Laporte. Certain improvements in the manufacture of candles.
2151. Matthew Atkinson and Benjamin Ridge. Improvements in the construction and setting of steam boilers for economizing fuel, and for rendering the same applicable not only to the generation of steam, but also to ventilation, the distillation of water for ships' use, and the distribution of heat for general purposes.
2199. William Edward Newton. An improved mode of constructing elastic bed bottoms, applicable also to sofas, settees, and other seats. A communication.
2201. George Tomlinson Bousfield. Improvements in locks for fire-arms. A communication.
2206. William Patterson and George Patterson. Improvements in machinery or apparatus for moistening or damping woollen or other textile fabrics for finishing.
2215. Henry Cornforth. A new or improved manufacture of hooks and eyes.
2256. Etienne Francois Vion. An improved tea or coffee-pot.
2257. William Henry Lancaster and James Smith. Consuming smoke, and for generating and diffusing heat in furnaces, and in furnace or other flues.
2267. John Thornton, Albert Thornton, William Thornton, and Henry Thornton. Improvements in machinery for the manufacture of looped or knitted fabrics.
2324. William Henry Walton. An improved machine for carding, combing, or preparing fibrous substances.
2366. Alfred Gregory and John Jillings. Improvements in cleansing the basin or pan of water-closets, and in apparatus for the same.
2390. Joseph Robinson. Certain improvements in winding clocks.
2394. Frederick Crace Calvert. Improvements in the treatment of copper slags, scoriæ, or cinders, so as to obtain the iron which they contain.
2404. Joseph Hands. Improvements in preserving animal and vegetable substances for food.
2418. William Cartwright Holmes. Improvements in steam-boilers, and in the mode or method of preparing or generating steam, and in the apparatus connected therewith.
2479. William Henry Walenn. An improved mode of flattening cylinder glass. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

659. John Edward and Charles Gosnell
672. Stephen Carey.
685. Robert Knowles.
709. George Lucas.
712. Christian Sharps.
713. John Henry Johnson.
714. Henry Huart.
722. George Kendall.
727. John Henry Johnson.
742. Hugh Greaves.
750. John Mirand.
757. Thomas Taylor.
837. Augustus Turk Forder.
953. Richard Archibald Brooman.
1121. George Beadon.

LIST OF SEALED PATENTS.

Sealed October 30, 1855.

1739. Joseph Robert.
1743. John Clarke.
1751. Rudolph Bodmer.
1755. Henry Hough Watson.
1773. Edward Hall.
1787. John Henry Johnson.
1799. John Sidebottom.
1803. Alonzo Webster.
1839. Thomas Kempson.
1871. George Collier.
1879. Alphonse René Le Mire de Normandy.

Sealed November 3, 1855.

991. William Rowett.
992. John Platt and James Taylor.
994. Fielding Fletcher.
996. Rodolphe Thiers.
998. Joseph Lacassagne and Rodolphe Thiers.
1000. Daniel Dalton.
1006. Matthew Butcher and Thomas Henry Newey.
1024. Charles Claude Etienne Minié.
1026. Daniel Foxwell.
1070. George Robinson.
1102. Thomas Richardson.
1110. John Knowles and Edward Taylor Bellhouse.
1113. Thomas Dawson.
1154. Homer Holland.
1201. Auguste Edouard Loradoux Bellford.
1209. Joseph Bennett Howell,

1214. Auguste Edouard Loradoux Bellford.
1468. Denis Daniel Buhler.
1880. André Dubrulle.
1904. Thomas Eyre Wyche.
2028. Louis Dameron.

Sealed November 6, 1855.

1023. William Burtt Wilton.
1027. Thomas Taylor Lingard.
1074. George Whyatt.
1112. Wharton Rye.
1410. Robert Walker and Alexander McKenzie.
1714. George Woods.
1918. Thomas De la Rue.

Sealed November 9, 1855.

1043. Richard Shiers Markindale.
1053. Alfred Vincent Newton.
1063. Constantine Henderson.
1069. Frederick George Sanders.
1076. Peter Armand Lecomte de Fontainemoreau.
1086. Robert Morrison.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

E. F. Hutchins and *C.*—Your communications shall be attended to as soon as possible.

A Schoolmaster.—Your papers do not sufficiently explain the action of the shot described.

Engineer.—Yours shall be inserted as soon as we can find space for it.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City* of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1685.] SATURDAY, NOVEMBER 24, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

SMITH'S COMBINED TRENCHING AND SUBSOIL PLOUGHS.

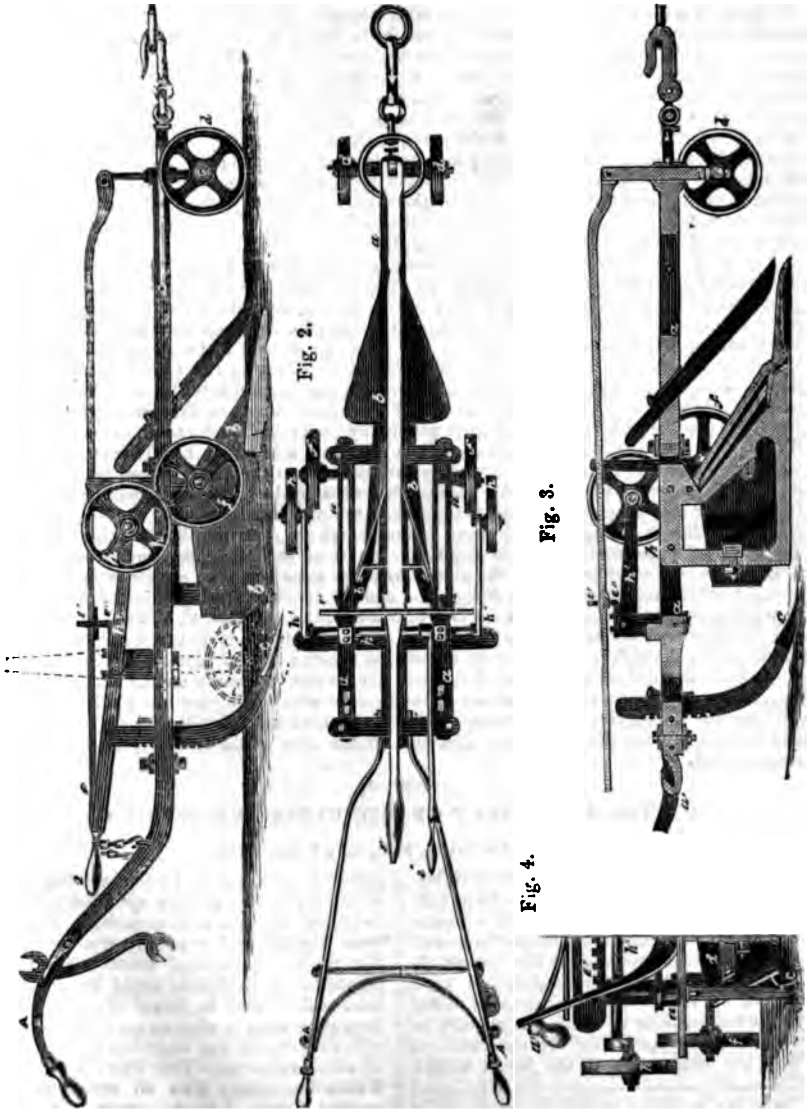


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

SMITH'S COMBINED TRENCHING AND SUBSOIL PLOUGHS.

(Patent dated March 19, 1855.)

MR. W. SMITH, of Little Woolstone, Fenny Stratford, Bucks, has patented an invention which consists in combining subsoil ploughs with trenching or double-mould board ploughs, and in such manner that part of the framing by the aid of wheels will, when required, cause the ploughs to be raised out of the land. For this purpose he combines one double-mould board or trenching plough with two subsoil ploughs, the subsoil ploughs following in the trench made by the other. A beam is employed, at the fore part of which is a guide-wheel, and to this beam is affixed a double mould-board or trenching plough. At the hinder end the beam is made with handles similar to other ploughs. To the beam is formed a framing, which at its front end has two wheels, by which the depth of ploughing is regulated; and the two subsoil ploughs are affixed towards the back end of this frame at such a distance apart as to work within the trench made by the trenching plough. In order to raise the ploughs out of the land at the end of a field two additional wheels are used, which are carried by arms from an axis across the frame of the plough, to which axis is applied a lever or handle, by which the arms when the ploughs are at work are kept in a horizontal position, and the wheels which they carry are therefore off the land; but so soon as the lever or handle is released the wheels drop on to the land, and the continued movement of the ploughs cause them to be lifted up out of the land. For some purposes he combines two such compound ploughs into one plough, which will consist of two trenching or double-mould board ploughs, and form subsoil ploughs.

Fig. 1 of the engravings on the preceding page shows a side view of a plough constructed and combined according to this invention; fig. 2 is a plan of it; fig. 3, a longitudinal section; and fig. 4 a back view of one half of it. In each of these figures the same letters are used to indicate the same parts. *a, a* is the beam and framing of the plough, the nature of which is clearly shown in the drawing; *b, b* is a double-mould board or trenching plough; *c, c* are two subsoil ploughs, which follow in the trench made by the double-mould board plough; *d, d* are guide wheels at the fore part of the beam of the plough; and *e* is a handle, by which the vertical axis of the wheels may be moved or steered. Such handle is capable of being retained from moving by the rack *e'*, such rack holding the handle from movement when the projection *e''* on the under side of the handle enters between two of the teeth in the rack. By lifting up the back end of the handle it can be moved so as to place the guide-wheels in the position desired, and then the handle will be retained from further movement by allowing the back end to drop, and be held by the rack. *d', d'* are the handles to the beam and framing of the plough; *f, f* are wheels, the axles of which can be raised or lowered in order to govern the depth of the ploughing, such wheels running on the land on either side of the plough when the same is in use; *c, c* are two subsoiling ploughs, which are carried by the frame, *a, a*, and are capable of being adjusted, as shown, to work to the depth desired; *h, h* are two wheels mounted on arms, *h', h'*, fixed to the axis, *h''*. These wheels are kept up out of position, when the plough is in use, by means of the lever-handle, *i*, which is kept down by a chain, as shown; but so soon as the lever-handle is released, and the plough is moved forward, the wheels, *h*, coming on the land on either side, cause the plough to be lifted out of the land, in which condition the plough may be conveniently drawn over land on roads. When more than two subsoiling ploughs are used, one is fixed between the other two. The form of the tines of the subsoil plough is sometimes varied.

ON THE MACHINERY OF THE PARIS EXHIBITION.*

BY W. FAIRBAIRN, ESQ., C.E., F.R.S., ETC.

IN the capacity of juror at this Exhibition, I have endeavoured to collect and bring together a series of facts, in connection with the various forms and adaptations of the objects that have come before me, which I trust may prove advantageous in promoting the furtherance and extension of the industrial pursuits in which this country is so largely engaged. In the classification that has been adopted the jurors might probably be expected to confine their observations to the articles specified in their respective classes, but conceiving that a more general and comprehensive description of the mechanical contrivances displayed in this exhibition might be useful, I have endeavoured to record them in such form as to show in what we are different, and wherein consists our superiority over those of other countries. The Paris Universal Exhibition differs from all others in its general character, by the extent of its productions, the variety of its objects, and the

* *British Association*, 1855.—The publication of this article has been unavoidably delayed.

[redacted]

facilities afforded for the disposal of the exhibited articles at a fair market price, and these conditions are of great value to the exhibitors in the immense selection submitted to view. In this respect it differs from the Exhibition of 1851, and looking at the numerous specimens of the raw material, and the display of the article manufactured, we at once arrive at the conclusion that it is an immense bazaar, from which may be selected every description of manufactures from almost every kind of produce. In this Exhibition there is nothing strikes the observer more forcibly than the beauty and the extent of the articles offered for inspection, and the great ingenuity by which such vast and varied forms of manufacture are produced. In the department of machinery it may be interesting to trace the development of many ingenious contrivances. The self-acting and almost creative power of machine tools, and the facilities with which that branch of manufacture is endowed for the production and reproduction of other machines, is a feature of incalculable importance to the national industry. Many of them now in constant use had no existence a very few years since; but such has been the onward progress in mechanical science that these machines, for the most part self-acting, surpass the most skilful efforts of the human hand. Such, in fact, are the advantages derived from the introduction of this kind of machinery, that the produce of our manufactures is multiplied and extended ten and in many cases upwards of a hundred fold. In the process of copying, or the reproduction of the same article by mechanical means, there are in this Exhibition numerous examples. We are indebted to the Americans for many clever and ingenious contrivances in this department of practical science, and their system for the formation of objects by *dummies*, or what may be called the pentagraph system, which traces the form of every part of the object, and by proper tools and cutters produces a fac-simile of the article required to be copied. This system of reproduction is fast coming into general use, and many examples of its utility are extensively shown in the Paris Exhibition. Entertaining these views I shall briefly examine the present state of the steam machinery of France and other parts of Europe, in comparison with those of our own as exhibited in that section of the Exhibition of 1851.

STEAM ENGINES AND STEAM MACHINERY.

The number of steam engines in the Exhibition is 112, consisting of 71 stationary, 24 marine, and 17 locomotives, as follows:

	Stationary.	Locomotives.	Marine.
France	25	6	11
Great Britain	11	2	11
Austria	11	1	—
Prussia	1	1	—
Belgium	1	3	—
Hanover	—	1	—
Wurtemburg	—	2	—
Baden	—	1	—
Sweden	11	—	1
United States	11	—	—
Holland	—	—	1
Total	71	17	24

STATIONARY ENGINES.

The department of stationary engines comprises almost all the varieties of construciron—horizontal, vertical, and oblique. The horizontal with one cylinder appears to be much in demand, and the vertical with two cylinders, upon Woolf's principle, having an expansion from four to five times the volume of the small cylinder, has for many years existed in France. This description of engine has been for the last half century in general use in that country, and almost equally so in Belgium and most other parts of the continent. They are worked generally at a pressure of 40 lbs. to 50 lbs. on the square inch, and the steam is supplied from boilers, with the fire under the two longitudinal tubes. These tubes are connected with the boiler at both ends, and the heated currents having made two or more circuits of the boiler, make their escape to the chimney in the usual way. These boilers are not, in my opinion, superior in the economy of fuel to those with internal flues, or the tubular system as constructed in this country; but their resisting powers to internal pressure are greater than boilers of larger dimensions. The horizontal single cylinder engines appear to be gaining ground upon the double cylinder vertical engine, and, doubtless, this arises from their superior economy (not in fuel but in price), their compact form, and the limited space which they occupy; and now that metallic pistons are so accurately constructed, the wear and tear upon the cylinders is greatly reduced. The condenser is placed below the cylinder, and the air-pump is worked by a lever attached to the cross-head of the connecting-rod and horizontal slides. The air-pump, like the cylinder, is placed horizontally, and various forms and devices are adopted in order to give the required motion of the feed-pump, and other organic parts of the engine. The valves in most of those engines are of the usual construction, worked by an eccentric from the fly-wheel shaft, but they have peculiar features of a

variable laps working through the spindles of the valves, and by a moveable cam which works in a square frame at the end of the spindle, any required expansion can be obtained. This appears to be a very ingenious and a very simple contrivance, and seems to answer the purpose of cutting off the steam at any required point of the stroke. The consumption of coal in this engine is represented to be $\frac{1}{10}$, $\frac{1}{15}$, and $\frac{1}{20}$ kilogrammes of coal, per horse power per hour, or about 3 lbs. English, and in order to convince the public of the truth of this statement the makers publicly announced that they offered a guarantee that it shall not exceed that amount. The application of the horizontal in place of the vertical cylinders is not a new idea; on the contrary, it is nearly as old as the steam engine itself; but the difficulty in former days was the want of tools and accuracy of construction in order to render the working parts smooth and steam tight. This is no longer an obstacle, as the perfection of the automaton tools surmounts all those inconveniences, and hence it follows that the conceptions of former days—which for want of the instruments requisite for construction—have remained in *statu quo* up to the present time. Such are the retardations, and such the advancement of science: one generation conceiving schemes and projects which for want of the means they are unable to execute; and another having, in the process of time, realised those means have enabled them to perform what their predecessors had worked in vain to attain. In the realisation of old ideas there appears to be a strong desire on the part of the successful practitioner to force upon the world their adopted bantling as an original conception. No doubt there is great merit in being the first to perfect an original invention, but there is no merit in claiming as a discovery what was known before. There is great credit in being the first to render useful what was before considered impracticable, and in this position the practical practitioner is certainly entitled to credit. In the Paris Exhibition the claimants for originality of design, and the practical application of others previously known, are numerous on all sides; and although the desire to become an original inventor may in some cases be objectionable, it nevertheless has its use in stimulating that active race to renewed exertions in furtherance of future developments in practical science. The reduced cost and compact form of the horizontal engine is likely to supplant the old vertical system, and assuming the same rate of expansion to be in operation, and the steam to be cut off at one-fourth or one-fifth of the stroke, the result will be—so far as regards the economy of fuel—the same as that derived from the double cylinder, and that by a much less expensive engine in the original cost. In this country these improvements, although well known, are not carried to the same extent as in France; notwithstanding that the same kind of engine is in operation, they have, nevertheless, made slower progress, excepting only the horizontal non-condensing engine, which is now extensively used as an auxiliary force in most of the manufacturing districts. There is, however, still wanting a well-digested system of the horizontal condensing engine, compact in form, and adapted to the work it has to perform. Much has yet to be done in this way; and the Paris Exhibition presents numerous examples for our guidance.

LOCOMOTIVE ENGINES.

The locomotive engine had its origin in this country, and as yet retains its superiority over all others, both in design and construction. It would, however, be illiberal and unjust if we did not accord great merit to the many excellent specimens contributed to the Paris Universal Exhibition. It will be observed that of sixteen locomotive engines exhibited, nearly all of them are somewhat complex in arrangement and design, but evincing great care and attention to solidity of construction. Many of the engines are upon the system of Crampton, with the valve motions outside, which gives to the engine an appearance of complication that does not occur in those of English construction. In other respects the engines are the same as our own, with the link motions, and other indispensable attachments.

MARINE ENGINES.

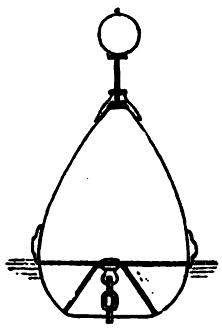
In marine steam engines there is little to recommend, as the contributions are very scanty in that department, and will not bear a comparison with those that were exhibited at the Crystal Palace in 1851. With the exception of a pair of neat engines from the Mortala Works in Sweden, two pairs from Cail and Co., and a small pair from Tod and M'Gregor of Glasgow, for the screw propeller, there is nothing besides models that deserve the name of marine construction. In short, the specimens exhibited, with the exception of those named, are not of the best and simplest forms, and cannot, therefore, be considered of much value, either as regards design or construction.

(To be continued.)

ON THE CONSTRUCTION OF BUOYS, BEACONS, &c.

A paper on the above subject was read at the Institution of Civil Engineers on the evening of November 13, by Mr. G. Herbert.

Floating sea marks, as ordinarily constructed, were, it was stated, admitted to possess the defect of riding uneasily on the waves, under which they were frequently buried, so as to be scarcely visible when most required; besides which it was not an uncommon circumstance, in heavy weather, to find that a buoy had broken its chain and floated away. The present form of the buoys, and the fact of the mooring chains being attached to a point far below the centre of gravity, sufficiently accounted for these and other acknowledged defects, and induced the proposition of a form of stationary floating body which should have a tendency to ride easily, and to retain its perpendicularity, whilst the point of attachment of the mooring chain would be in such a situation as to subject it to the least amount of strain, and not be liable to draw the buoy down into the trough of the waves. With this view a wrought-iron pear-shaped buoy was constructed, of a circular form in plan, and terminating above in an apex, so



distributing the weight as that the centre of gravity should be situated a little below the centre of the plane of flotation, and the bottom was made concave and raised up internally, so as to form a cone, to the internal apex of which the mooring chain was attached.

This form was found so completely to answer the purpose, that several buoys were made by Messrs. Brown, Lennox, and Co., for the Corporation of the Trinity House, and were pronounced to be superior to any previously built. A buoy of 9 feet in height, 6 feet 6 inches diameter, and having only 2 feet of the body submerged, exhibited, under all circumstances of wind and tide, an upright body of 7 feet out of the water. This quality of retaining its vertical position arose from the force of the tide, or wave, being simultaneously exerted upon one side of the exterior of the buoy, and on the opposite side of the interior cone; the forces so nearly balancing each other as to retain the floating body in an almost perpendicular position.

Encouraged by the success of the first experiments, the Trinity House authorised the construction of a wrought-iron sea beacon on the same principle. The floating base was 20 feet in diameter, divided by radiating bulk heads into six water-tight compartments; it drew 4 feet 6 inches water, and supported a tower, also of wrought-iron, 28 feet high, 7 feet diameter at the base, and 3 feet 6 inches diameter at the top, surmounted by an iron ball of the same diameter. This beacon was moored in the over-fall of the sea at the South Sand Head of the Goodwin Sands, and was admitted to have been the best and most conspicuous sea mark ever laid down. During very heavy storms it was observed that the greatest angle assumed by the tower did not exceed 10° from the perpendicular, without any tendency towards circular motion. When it had been afloat for about five weeks, it was observed to sink gradually during very moderate weather, evidently from having sprung a leak. It was conjectured that this casualty arose from the mooring chain having been improperly fixed in the hawse-pipe of the cone instead of being below it, and thus that the links were brought into contact with the plates of the compartments, which, being only three-eighths of an inch in thickness, were soon chafed through, probably in several places simultaneously; and the several compartments becoming filled with water, the beacon was submerged. The recurrence of such casualties in similar structures could in future be easily remedied by attaching the mooring to the proper point in the cone, as is done in the buoys, and thus guard against the possibility of any friction against the body of the water-tight compartments.

It was now proposed to carry out this principle of construction upon a larger scale, and to erect upon the floating base a tower sufficiently large to serve as a substitute for a light-house. A plan for such a structure, as submitted to the Trinity House by Sir Charles Fox, was described. The floating base was 80 feet in diameter, and drew 20 feet water; the tower was 130 feet high, 24 feet in diameter at the base, and 14 feet at the lantern; the weight of the tower and lantern was 117 tons, and the total displacement of the whole building was

1,602 tons, the centre of gravity being 2 feet 6 inches below the surface of the water. The weight of a double mooring chain, the links of which were 3¼ inches diameter, would be about 46 tons in about 30 fathoms of water when under the greatest pressure of wind and tide, and the catenary curve would then be about 47° from the perpendicular; the extreme pressure to which the chain would be subjected afloat would not exceed 92 tons. The security of this sea light-tower would depend upon its moorings, which, for greater certainty of holding, should probably be Mitchell's screw-moorings, represented in the accom-

panying engraving, within certain limits of depth; and if the chain weighing 46 tons was not considered sufficiently strong, any additional strength might be added, and would only have the effect of immersing the floating base a few inches more. In the event of any unforeseen occurrence causing the sea light-tower to break adrift, it could immediately and with certainty be brought up by a spare chain and anchor.

The extreme pressure of the wind upon this structure would not exceed 34 tons, and that would only cause the tower to incline about 1° 28′ from the perpendicular. The pressure caused by the speed of the tide, at 4 miles an hour, could be taken at 30 tons, son the immersed portion.

ome interesting observations, made by Douglass, in 1853, at the request of the ior, *on the number, height, and speed* ves—*at the lighthouse* in course of construction, at Bishop Rock, the most westerly of the Scilly group, tended to confirm the opinion, that little or no inconvenience would result from the action of the waves, even in that exposed locality. The statement showed, generally, that waves which when measured from the hollow to the unbroken crest, had a height of

8 feet,	were in number 35 in	1 mile,	and 8 per	min.
15 ,,	do.	5 & 6	do.	5 ,,
20 ,,	do.	3	do.	4 ,,

The new form of sea light-tower was proposed to mark the sites of shoals, or rocks, or islands, which were difficult of access. Lighthouses for this purpose being generally required as warning, rather than as guiding lights, it usually was of little importance whether the light was exactly upon the point of the rock from which it was intended to warn a vessel, or whether it was a short distance from it, so that the existence of the danger was made manifest.

It was submitted, that this form of construction might be advantageously employed for "guiding," or "fair-way" lights. The problem of exhibiting lights of any considerable altitude in very deep water had not hitherto been solved, and consequently the majority of the lights, now in existence, were not those leading into a right channel, but those which warned from a wrong one; and so long as that plan was followed, the system of lighting would be one-sided and defective. Practical men, however, now appeared to think that the old system should not be continued, and as the sea light-tower was capable of being moored in any depth of water, however great, it might be placed midway in any channels, as an invitation to the right course, and thus insure to all vessels a safer and a speedier navigation.

The lighthouse on the Skerryvore Rock occupied seven years in building, and cost upwards of 90,000*l.*; whereas, by means of the sea light-tower, the same object might be accomplished in one year, at a cost of 30,000*l.* The site of the Bell Rock could be equally efficiently marked, at a cost of about 20,000*l.*, instead of 60,000*l.*; and that of the Eddystone, at about 15,000*l.*, instead of 40,000*l.*; and the new form of light-towers would possess the advantage of being accessible in all weathers.

The observations were limited to sea marks, but if the principle of construction proved to be correct, it would evidently be applicable to floating forts, and to almost every other description of stationary floating body, several designs for which were exhibited.

STEAM BOILER EXPLOSIONS:

M. ANDRAUD'S METHOD OF PREVENTING THEM.

In our No. for August 14th, 1855, (No. 1669) page 104, we published a paper on the above subject, addressed to His Excellency the French Minister of Agriculture, Commerce, and Public Works, by M. Andraud, and in the following No. we also published a letter from a correspondent, E.W.F., criticising the paper of M. Andraud, and controverting his theory. This letter having been transferred, in a condensed form, to the pages of the September No. of the French Journal *L'Invention*, has elicited the following rejoinder from M. Andraud, which appears in the October No. of that Journal.*

"It is said," says M. Andraud, "1. That the experiments of Mr. Faraday *prove* that electricity is not formed in the steam, as I suppose, but is produced only by the friction of molecules of steam against the sides of the tube through which it escapes. 2. That if electricity be formed in the steam, it will be conducted away by the metallic vessel which contains it, and which is in communication with the soil. To this I answer:

"Firstly; the experiments of the illustrious professor, when properly understood, *prove*, on the contrary, that the steam is always saturated with electricity, as it is only necessary to pass it against the sides of a tube in order to render its electricity manifest; for, whence could it come if it were not in some way concealed in the steam? It is not apparently simply the friction which generates the electric fluid. That merely renders it evident, as a blow renders evident the fire concealed in a flint. Will any one say that steam, although perfectly dry, developes no electricity—that it is necessary, in order to produce it, that globules of water should be present? Be it so; but then I have observed that this is precisely the ordinary condition of the steam in the boiler: it is never perfectly dry; it always holds in suspension numerous globules which tend to produce priming, to the great discomfiture of engineers. Well, why may not these globules, subject to the violent agitations in the boiler, produce electricity by friction amongst themselves or against the sides of the boiler? The effects which are obtained without, may certainly be produced within. And, it should be observed, this harmonizes perfectly with what I said in my Mémoire—that with high pressures (and dry steam) there is nothing to fear; and that with low pressures (and steam moist and containing watery globules) there is always serious danger.

"Thus the experiments of Mr. Faraday demonstrate the existence of electricity in the mass of the steam, either latent or otherwise, and thus support my opinion.

"I now come to the second objection, that is, that if electricity be formed in the steam it will be conducted away as fast as it is produced. That is precisely what occurs. I willingly admit it; without this continual escape of the dangerous fluid, steam engines would be impossible; they would be continually exploding. Explosions are, however, exceptional occurrences, and are very rare; but, as I have said, notwithstanding this continual conduction, it sometimes happens that the electricity becomes isolated, and consequently explosive. The question is, how is this isolation produced? For my own part I have been led to believe that it is brought about within the boiler as in the atmosphere, where the electricity, which is ordinarily diffused and in communication with the earth, sometimes accumulates in thunder clouds. M. Jobard, who believes that electricity is the cause of explosions, thinks that the isolation is occasioned by the excessive heat, which is radiated from the boiler, drying, and in some way vitrifying, surrounding bodies, thus depriving them of their conducting power."

* * * * *

"Whatever be the cause and the mode of formation of the electricity, the essential point, in my opinion, is to withdraw it before it reaches an explosive state. That is why I recommend, and persist in recommending, the use of my conducting rods. Besides, what injury can they do? If my *electro-soustracteurs* do no good, they can do no harm. A disastrous explosion took place a few days since at Rouen. The maker of the boiler sought me in order to obtain information concerning the mode of fitting my safety apparatus; he assured me that the proprietor of the factory at which the accident occurred, having twenty other boilers in operation,

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* *L'Invention* introduces its paraphrase of E.W. F.'s letter with the following words: *Considérant l'importance de l'étude d'une pareille question, nous portons à la connaissance de nos lecteurs et de M. Andraud une controverse que nous extrayons du* MECHANICS' MAGAZINE." It also places the paraphrase in inverted commas. The consequence is, M. Andraud (and probably others also) is apparently led to consider the paraphrase of a correspondent's letter as an editorial article; M. Andraud says, in his letter to the editor of *L'Invention*, "*Votre numéro de ce mois-ci contient une note extraite du* MECHANICS' MAGAZINE, *laquelle tend à combattre mon opinion.*" It is perfectly evident that editors can neither reject all communications of which they do not altogether approve, nor hold themselves responsible for the opinions and arguments put forth in all that they insert. Consequently, when the letters of correspondents are transferred to other journals, care should be taken to distinguish them from editorial comments. We beg to direct the attention of the editor of *L'Invention* to this point.—ED. M. M.

wished to apply the apparatus to them. I shall congratulate and thank him for it; he will have the merit of having been sufficiently energetic and humane to take the initiative in a measure which the government has not yet prescribed."

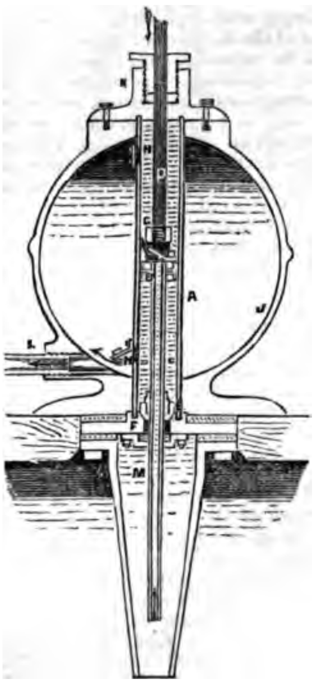
JOSLYN'S DOUBLE-ACTING PUMP.

BY H. HOWSON, C.E.

THE annexed engraving represents a sectional elevation of a double-acting pump, for which a patent was granted to B. F. Joslyn, of Worcester, Massachusetts, in April last.

In designing this pump, the object of the inventor has been to maintain the flow of water to and from the barrel in as direct a line as possible, and to avoid the tortuous passages which usually occur in double-acting pumps, and which present such serious impediments to their efficient working.

In Joslyn's pump, the barrel, A, is a plain tube of brass maintained in its proper



vertical position by the top and bottom of the air vessel, J. The top of the barrel fits into an annular groove in the cover, K, and the bottom in a similar groove cut for the purpose in the flanched valve-seat, F.

The yielding substance of the packing, used in attaching both cover and seat to the air vessel, J, allows the barrel, A, to be bound tight between the two.

B is the pump-piston or bucket, composed of two metal disks, with leather packing between, and turned up on their edges in the usual manner.

Into the bucket is screwed the suction-tube, C, above the orifice of which, and on the top of the bucket is a valve opening upwards. The tube, C, is carried down so far that its end may, as the pump operates, be always submerged in the reservoir below.

D, is the pump-rod, connected to the bucket, B, by the arched piece, G, which is of such a form as to allow the valve on the bucket to work freely.

The rod passes through the stuffing-box on the cover, K, and is connected above to any suitable handle or other convenient driving apparatus. E is a valve composed of two pieces, one screwed into the other with a light packing substance between, and through this valve passes the tube, C, easily enough to allow the valve to work with freedom, the packing at the same time preventing any leakage. The valve, E, is prevented from rising too high by projections on the inside of the barrel, and the tube, C, is guided by a guard under the seat, F. The barrel is furnished with upper and lower discharge-valves, H, and the air vessel with the discharge-pipe, L. M is the main suction-pipe with flanches on the top to secure it to the under side of the air vessel, the same fastening serving for the valve-seat, F.

On the descent of the bucket, B, as shown in the engraving, the suction-valve, E, and upper discharge-valve, H, are closed, and the water in the barrel below the piston is forced through to the lower discharge-valve into the air vessel, and through the pipe, L, to its destination; at the same time the water from the reservoir rises in the tube, C, passes through the bucket-valve, and fills the space above.

On the upward motion of the bucket, the lower discharge-valve, H, is closed, and the valve, E, opened, while the bucket-valve being closed, and the upper discharge-valve open, the water above the bucket is forced through the latter into the air vessel, and through the pipe, L, at the same time a fresh supply of water is admitted through the main suction-pipe, M, and valve, E, to the space below the bucket preparatory to being again discharged on the descent of the piston.

The simple method of securing the barrel, which is a plain brass tube inside the air vessel, together with the peculiar arrangement of suction-tube and valves, ren-

der the whole a double-acting pump of most economical and durable construction, while the flow of water throughout being nearly in a direct line, a less degree of power is expended in operating the machine than is employed in other pumps, while the supply of water is more efficient and regular.

The whole apparatus is easily taken in pieces, and as easily repaired when out of order, which recommends it as a pump peculiarly adapted to agricultural purposes: it may with equal advantage be used in all cases where a simple and efficient pump is a desideratum.—*Journal of the Franklin Institute.*

RAILWAY ACCIDENTS.

"Another railway accident—and yet another! There are a few blank days in the tragic chronicle. Smash follows crash, and crash smash."—*Times, Oct.* 16, 1855.

The Bill "For the better Prevention of Railway Accidents" having been squeezed out of Parliament last Session, it is to be hoped it will have especial attention accorded to it in the next. The paltry economy resorted to by boards of direction, with respect to many of the details essential to the safe and efficient working of railways, requires no comment. Apparently, nothing short of a compulsory law will ever put a stop to their penny-wise and pound-foolish policy. There would be little hardship in passing such an Act (as was done in the case of the smoke nuisance) were the Board of Trade perfectly aware that there existed means, absolute and certain in their effect, of effecting those communications on railways from the want of which accidents most commonly result.

It is a reproach to us, that in these days, in which steam plays so important a part, its use should not be more regulated and controlled than it is, by the agency of electricity, which has been placed, as it were, in our hands especially for this purpose. There is no good reason why the danger which is now associated with the rapidity of steam travelling, should not be removed by the employment of electricity, which travels almost immeasurably faster than the swiftest locomotive.

The most fatal railway accidents that have occurred have resulted from one train running into another—in some instances slow trains into fast ones, from an axle giving way in the latter, or from some similar circumstance; and as these chances of accident necessarily increase with every increase in the traffic, a complete system for signalling from station to station is becoming absolutely required. The additional fact, that when a train is in motion, the guard at the rear of the train is totally without the means of making a signal to the engine-driver, in consequence of the noise of the train when in motion, to say nothing of darkness, fogs, and the multiplicity of trains in the neighbourhood of the metropolis, also shows something of the risks that all are liable to.

The foregoing remarks will, however, be of but little avail to the travelling public in general, or to railway interests in particular, without some practical suggestion towards remedial measures; we are, therefore, glad to be able to state that, although without an Act of Parliament, or a more determined demand for the adoption of the necessary arrangements on the part of railway boards, much of the available talent of the country remains unapplied to this subject; and although the numerous empirical and fruitless attempts that have been tried heretofore only tend to throw discredit upon subsequent experiments; yet within the last few weeks certain plans and arrangements for communicating between guard and engine-driver have been practically worked on one of our Metropolitan lines, and have proved the practicability of working, by the agency of electricity, with accuracy and certainty over any length of train; while the means employed are of so simple a nature, that the manipulation may be altogether left to the uninitiated servants of the company, no knowledge of electricity being required, and the signalling being effected by presenting to the eye the common white, red, and green signals, accompanied by simultaneous and perfectly audible sounds. The same arrangements are, we understand, equally applicable to communications between adjacent stations. These plans and arrangements form the subject of patents obtained by Mr. T. Allan, C.E, of Adelphi-terrace, London, who, doubtless, will be willing to explain more fully to railway boards, or to the Board of Trade, the working details of his system.

A Manual of Electricity: Including Galvanism, Magnetism, Diamagnetism, Electro-Dynamics, Magneto-Electricity, and the Electric Telegraph. By Henry M. Noad, Ph. D., F.C.S., Lecturer on Chemistry, at St. George's Hospital, Author of "Chemical Manipulation and Analysis," &c. Fourth Edition. Entirely Re-written. Part I., Electricity and Galvanism. London: George Knight and Co., Foster-lane. 1855.

We are pleased to find that Dr. Noad's work, the previous editions of which as "Lectures on Electricity" were very highly and very deservedly esteemed, has been de-

veloped into this admirable Manual. The object of the author, which is to place before the public a statement of all that has been done up to the present time in the various branches of electrical science, is pursued with great skill and care in the volume before us, which embraces Electricity, Frictional and Voltaic; Thermo-Electricity; and Electro-Physiology. The subjects to be treated in the second part (which is promised early in the ensuing year), are Magnetism, Diamagnetism, and Electro-Dynamics, including a description of the principal Electric Telegraphs. As a work of reference this Manual will be particularly valuable, as the author has carefully recorded, not only the authorities from which he quotes, but, in all necessary cases, the words in which the writers have detailed their experiments and opinions. This is a very important advantage in a treatise on sciences depending largely upon experiment, the exact words of a philosopher being, in most cases, more useful to the reader than a paraphrase by a second person, however eminent he be. The publishers should not fail to have the next Part supplied with a copious analytical index of the whole work.

EXPANSION OF STEAM IN MARINE ENGINES.

To the Editor of the Mechanics' Magazine.

Sir,—When I last wrote I had no intention of again trespassing upon your space, until I had obtained some proof of the advantages of expanding steam in marine engines to a greater extent than is now usual. Some remarks in Mr. Mushet's last letter, however, induce me to add a few observations to those I have already made on this subject.

There are two distinct questions between us—first, as to the advisability of more fully expanding the steam; and, secondly, as to the best kind of engine to be employed. With regard to the first question, I do not, as Mr. Mushet supposes, confine myself to recommending greater expansion in low-pressure steam only, although I have thought that this would probably be the first step adopted by ship-owners in any attempts to economize fuel. As I have before observed, I fully appreciate the advantages of increasing the pressure; and a perusal of the paper which accompanies this letter, and which you are at liberty to forward to Mr. Mushet if you think proper, will show that I believe very great economy would result from such increase. Indeed, Mr. Mushet will find that the economy there shown agrees very nearly with Mr. Craddock's table given in vol. 47 or 48 of your Magazine. Of course all calculated economies should agree, by whomsoever given. If practical proof be required, I am not yet in a position to offer it, as very few cases exist in which the expansion of steam has been fully carried out in marine engines; and where they do exist, it is very difficult to get at the quantity of coal consumed. I believe many American engines are working with steam at 40 lbs. total pressure and cut off at ⅛th; there are also many pumping engines working with steam at 35 lbs. only, and expanding down to between 5 and 6 lbs. These latter are burning only 2½ lbs. per indicated horse power. Why, then, should not the same economy follow in marine engines? The cylinders may require jackets, and if so, let them be fitted with them.

I think Mr. Mushet, as well as your other correspondents, all nearly agree with me in believing that a vast economy is capable of being realized, especially if the pressure of the steam be increased. With 70 lbs. pressure I think 60 per cent. may be saved of the present consumption. With respect to the second question, as to the best kind of engine to be employed, I would beg Mr. Mushet to consider that my engine is designed as a *horizontal*, direct-acting, and short engine, and that, comparing it with Mr. Craddock's is useless, as his was not designed with the same intent. That a horizontal and short engine is sometimes required, is proved by the innumerable attempts made to arrange one. The inverted cylinders are much used on the Tyne; and if this arrangement be required, Mr. Craddock's engine may do. I have not professed to defend the use of horizontal engines, as it seems unnecessary. There is one other more important point which Mr. Mushet seems to forget, and that is, that my engine is arranged to work expansively, *without any expansion gear*, the slide cutting off, say at half stroke, at 50 or 60 revolutions per minute, the ordinary expansion gear is not capable of being worked.

As I presume you will soon object to the insertion of further correspondence on the subject of expansion in marine engines, I would conclude this letter by venturing to maintain that no arrangement of engine which I have ever seen or heard of meets the several requirements which I believe mine does; and I would beg Mr. Mushet to again consider the special objects with which it was designed. I think my challenge to produce a better engine is still unanswered. The breadth across ships would only be from 5½ to 6 times the stroke—no expansion gear. A short stroke this, giving any velocity to the shaft, and, practically, a very long cylinder; a *constant*

vacuum for the steam to act against, and a uniformity of action, which in a single cylinder is unattainable. This latter quality is not considered by many as of much importance, but I am of a very different opinion. I trust that it will not be supposed that I am unwilling to discuss the subject of expansion, or the various practical points of different engines proposed; my difficulty is that of having a great deal more to say than you would find space for, and partial statements are very liable to be misunderstood. If you could induce some of your correspondents engaged in working marine engines to give the details of any experiments on the consumption of coal when using their expansive gear, this would be one step towards arriving at the truth as to whether expanding steam in marine engines is not likely to be as beneficial as in other cases.

I am, Sir, yours, &c.,

EDWARD E. ALLEN.

PHANTOM PHILOSOPHY.

To the Editor of the Mechanics' Magazine.

SIR,—Permit me to offer my cordial approbation of the following rays from the spectrum of Mr. Bright's beams exhibited in your last number, teaching—"It is not so easy to build up a rational theory, consistent with itself and with the well-ascertained laws which regulate the motion of the material world, and that notions imbibed from popular works and popular illustrations are not very safe guides in the task either of demolishing an old or constructing a new theory." We read in the poets of a pathway bridging the hoary deep—

> "—and fix'd as firm
> As Delos, floating once."

We read also how—

> "Out of the earth a fabric huge
> Rose like an exhalation."

Of the latter are ephemeral systems, hastily reared upon the corner stones of a foundation fixed deep in physical truths, by a philosopher too profound and accurate for sciolists to fathom or endure. That discredit of a certain system which is rising round us, is not attributable to the confirmation of perturbations; it dates from the publication of those original views out of which unballasted philosophers nibble their little appropriations, and swell into large volume by facile dilution with *aqua pura*.

I am, Sir, yours, &c.,

DAVID MUSHET.

November 19, 1855.

BOYDELL'S TRACTION ENGINE.

To the Editor of the Mechanics' Magazine.

SIR,—Your remarks upon the letter of "W. B." in No. 1682, p. 417, so completely exhaust the subject, that I would not have trespassed upon your valuable space had "W. B." "*truly stated the nature of the dispute in question.*"

As the fig. 4 in his letter bears some resemblance to a sketch made by me, and to a model I had made when at the Carlisle meeting of the Royal Agricultural Society of England, to convince Mr. Boydell and his friends of the erroneous opinion they had formed of his invention, I cannot avoid supposing that I am, in "W. B's" opinion, one of those by whom "*the mechanical world is liable to be overturned.*"

In the sketch and model alluded to the guide-pulleys (little p) *were carried by the framework or body of the carriages;* this "W. B." has omitted to tell you.

To give "the head and front of my offending." I have asserted, that if a carriage be placed on a level roadway, as in fig. 1, the weights, W and W′ equal, and the guide pulleys be carried by the carriages, then no motion will take place, because the whole will be in equilibrio.

I now further assert, that if a carriage be

Fig. 1.

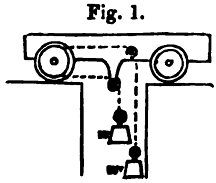


Fig. 2.

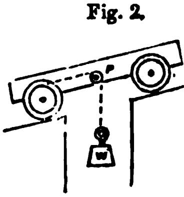
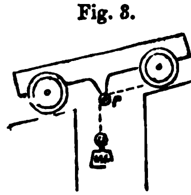


Fig. 8.



placed upon an inclined plane, as in fig. 2, having a weight, W, attached by a cord passing over a pulley, P, to the *top* of the "drum," and the weight be sufficient to

prevent the carriage from descending the plane, then, I say, that an equal weight, W′, fig. 3, attached in a similar manner to the *bottom* of the "drum" of the carriage will have the same useful effect, provided the carriages be equal in weight, the inclination of the planes alike, and the guide-pulley, *p*, be carried by the carriage in both cases.

From the "W. B." system of mechanics, as he has expounded it, I am led to believe that were he slung *beneath* an "invalid's chair" he would endeavour to propel it by thrusting at the *axle* of the carriage; whereas I, in a similar case, not possessing the "new light," would prefer using the *periphery* of the wheels, and it might happen that the *bottom* of them would be the best leverage for my purpose.

Having the original Carlisle model by me, I can send it to you, if you think proper; then any of your correspondents may test the truth of these assertions.

I am, Sir, yours, &c.,

C. E. AMOS.

Grove, Southwark, Nov. 15, 1855.

[As the assertions of our correspondent in the above letter are susceptible of very simple theoretical demonstrations (which it cannot be necessary to give here), an appeal to experiments with models is unnecessary. The remarks of Mr. Amos clearly show we were right in suspecting that the question really at issue was not then before us. Misapprehension is very likely to occur when such subjects as the present are under consideration.—ED. M. M.]

To the Editor of the Mechanics' Magazine.

SIR,—Having read letters relating to my traction engine in your publications of the 3rd and 17th instant, I take the liberty of enclosing a diagram and explanations, which I feel satisfied you will admit completely prove it to be a fact that, by working a pinion in the driving wheel of a carriage at the top, instead of at or below the centre, double effective power is gained without losing speed.

This I have proved practically in the presence of numbers, and amongst them several scientific persons, by drawing with an engine (having only 2,400 lbs. effective pressure on the pistons, with less than 10 per cent. gained by the difference of their speed and that of the driving wheel, which, if 10 per cent., would only give a total power of 2,640 lbs.) 4,000 lbs. on a pulley, and confirmed this by traction on the common road, up steep inclinations; the particulars of which I have described in a letter published yesterday in the *Mark-lane Express.*

I will not here enter further into the *statements* made by your correspondent "*W. B.*," with whom I entirely agree (see *Mech. Mag.*, No. 1682, p. 417); but I beg to call your attention to fig. 4, being a model made by the engineer of the Royal Agricultural Society at Carlisle, to contradict my assertion with regard to the power gained by the position of the pinion, because if looked into narrowly, it completely proves that assertion.

It is quite true that the model made at Carlisle was kept in a state of equilibrium by the weights as carried over pulleys, those pulleys being fixed to the carriage, which if propelled by the upper weight, would move in one direction; if by the lower, in the contrary. Now, what is the state of the case? The upper weight hanging over the upper pulley, presses against the forward motion of the carriage, at an angle of 45°, and the lower weight acts in favour of it at *the same angle.* Consequently, if the upper weight keeps the carriage in equilibrium, it acts *twice as powerfully as the lower one.**

I am, Sir, yours, &c.,

JAMES BOYDELL.

Camden-works, Camden-town, Nov. 20, 1855.

[To the above we need only reply that, in our judgment, the carriage *should* in both cases move in the same direction; and if so, the argument of Mr. Boydell does not hold. —ED. M. M.]

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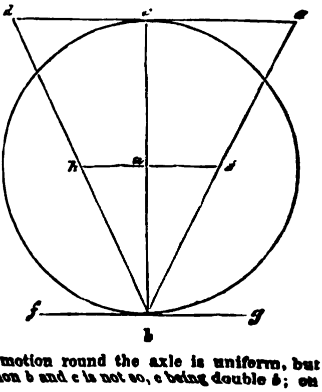
* The following is the *explanatory* note alluded to in Mr. Boydell's letter:

"An assertion made by the patentee being denied by eminent engineers—that his traction engine fitted with these wheels, will draw more over a pulley when moving forward, than it would if made stationary, with the drawing wheel fixed clear of the ground, and made use of as a drum barrel; and the patentee being satisfied that much more power, on level fields, is got on this account, than is sufficient to overcome the working of the *engine itself*, and which leaves more than all the steam power available for the traction of the load; he subjoins the following diagram and explanations, and respectfully submits them to public criticism.

"In the carriage wheel there are two movements, the one rotary and the other rectilinear.



The motion round the axle is uniform, but the motion b and c is not so, c being double b; on the

To the Editor of the Mechanics' Magazine.

SIR,—I perfectly agree with you as to the propriety of referring this great question raised on steam culture to the field. Practical farmers, like myself, who have joined the standard of "practice with science" (putting practice, you will perceive, first), will not trust to anything but actual experiment. We experience so many shortcomings in theory, if I may so speak, as perfectly to justify us in standing to our colours with all the fidelity of true soldiers.

As you have thus judiciously referred the matter to the field, there are two points on which I wish to offer explanation; the first of which affects myself, and the second, others.

Reviewing my letters, your readers would naturally suppose that I had been at Carlisle, and consequently took part in the first division of opinion. Now the fact is, I was not. On the contrary, I have since been put upon, in order, if possible, to get the question practically solved. For this purpose I am ready to adopt any plan either party may propose—models or no models, controversy or no controversy, public or private—perfectly aware that ultimately it must go to the field, as you recommend. I differ, for example, with Mr. Boydell, in many respects, having condemned his engine, *in toto*, long ago, as not doing justice either to his endless railway (his patent), or the mode of ploughing he proposes; and no later than last week, having met him by appointment, I succeeded in showing him that his experiments condemned himself. At the same time, I agree with him that his traction engine would not be so effective in the field, were the driving pinion on the end of the crank shaft to gear in the bottom of the large wheel on the carriage wheel, as it now is gearing in the top, the engine working up to its full (or a given) pressure of steam in both cases. But here I must not desert my golden standard, for in questions not experimentally settled I never trust my own conclusions, any more than those of others, until they are tested at the bar of practice, which the above, to a certain extent, have been.

The other question has reference to the invention of Mr. Osborne, now in the West Indies. Should Osborne adopt Boydell's endless railway, or Boydell, Osborne's engine and apparatus, with M'Crae's plough carriage, &c., it is high time the Royal Agricultural Society were getting ready dynamometers, for then we shall have as keen competition in the field with steam engines as we now have with horses. Consequently, I aver that Mr. Osborne should lose no time in granting licences, &c.; and probably were this to fall under his eye, he might be disposed to do so. I send you a copy of the *Mark-lane Express*, of the 19th, where this topic is treated at some length; from which you will perceive how necessary it is for us to be guided by experiment, and how much well-performed steam culture experiments in the field are wanted at the present moment.

I am, Sir, yours, &c.,

W. B.

London, Nov. 19, 1855.

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other hand, the progression of the carriage, and the rectilinear movement of the axle, are equal.

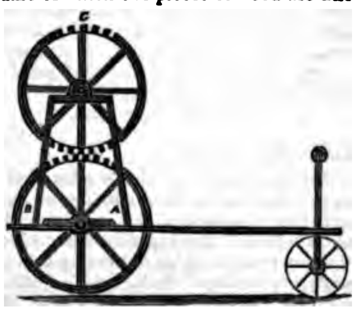
"The motion round the axle being uniform, the velocity of a pinion working at *b* or *c* must be equal, but the power required to work the pinion at *b*, is evidently very different from that at *c*, the powers being respectively, as the length of the line *d e c* is to *h a i* or *f b g*."

To the Editor of the Mechanics' Magazine.

SIR,—It will interest your correspondent "W. B.," who a fortnight since brought before the public a point in reference to the gearing of "Boydell's Traction Engine," to know that the question which he and his friends have raised, has lately been closely investigated and experimented upon, with results which plainly indicate, that a vein, rich and unworked, has been touched upon; besides which, anything novel in such a question must obviously be of general interest.

The ideas of "W. B." are perfectly familiar to me; they have occurred to my mind, and have been worked out some time ago, but in reality are but one aspect of the matter. I select two of my experiments to prove the positions which I have assumed, and to make it plain, that instead of this being, as might be supposed, a little simple matter, there is a great deal of room for profitable investigation of it.

The diagram represents a sectional view of one side of an ordinary velocipede, on the frame of which two pieces of wood are fixed,



A and B, with a cross top, to carry the axle of the upper wheel. A ring of cogs is fastened to the "driving wheel," into which the cogs

of the upper wheel take. Both are cogged all round, though the remaining cogs are not delineated, it being unnecessary. The other side of course is similar, the axles passing right across the machine.

The experimenter stands on the ground, in the rear of the carriage, (or to the left of it in the figure), and putting his fingers between the top cogs at C, pulls horizontally towards himself, with a force far more than equal to the frictions of the machine, but yet not violently; every one of scientific knowledge to whom this problem is proposed forthwith predicts motion in advance (or from left to right in the figure); it is enough to say, that to their great surprise such a result does not take place, although the same amount of power is shown to be capable of easily moving the machine under other circumstances. What the result really is, it is not necessary for my present purpose to state; it may be interesting to *suppose* what it is. The other experiment consists of applying the same power, under the same circumstances, and in the same direction, to the upper wheel, midway between the circumference and the axle, above the latter; motion will result, but it will be *towards the operator*. To see the experiment performed will at once dispel all such objections as—"Then the cogs must be stripped off;" "It can't be;" "You must be mistaken," &c. To the experiment, and to the fact, I point, tried by any one who likes, and not solely to the opinion or statement of myself or others who have seen it already. It has been repeatedly performed, and can be done again. The results are so evidently contrary to many received ideas, that it is unnecessary to point out the contradiction. I believe them to be in accordance with the fundamental principles of science, and am prepared to show that that is the case, although I conceive that they point to some important misapprehensions. Other experiments confirm this view of the matter, but while I express my opinion that some unsound ideas are prevalent respecting an important class of machines, I remember that my views have not been subjected to the test of general criticism.

I am, Sir, yours, &c.,

C.

London, Nov. 13, 1855.

[Our correspondent "C," is altogether at sea, and not, as he imagines, landed in a mechanical California, over a "vein, rich and unworked." The experiments he selects are by no means capable of proving that the question opened by "W. B." in No. 1682, is more than "a little simple matter." Had we been present at his trials with the velocipede, we should have predicted just the contrary to what he asserts "every one of scientific knowledge to whom this problem is proposed forthwith predicts," and should have pronounced it impossible for the machine to move at all, when the propelling force was applied at C, and impossible for it to do other than start "towards the operator" when that force was applied to the upper wheel "midway between the circumference and the axle, above the latter;" and we should have so pronounced, not because we reject, but because we believe in mechanical science. The problem may be treated in several ways; perhaps the following is as simple as is necessary:—

If we suppose the propelling force, P, to be applied, not by the hand, but by means of a string wound on a drum carried by the axle of the upper wheel, and also suppose the reaction of this force to be independent of the machine (as it will if the operator stands on the ground, and merely pulls the string instead of the cogs), we may easily foretell the behaviour of the carriage by applying to the circumstances the principle of "virtual velocities." Let s be the space through which the vehicle moves; s' the corresponding space through which any point in the string moves towards the operator; and R the resistance to motion. Then we have

$$P s' = R s.$$

In whichever direction the carriage travels, s' must, of course, be positive, and must be equal to the difference between the two other spaces—that due to the translation of the whole system, and that due to the winding up or the unwinding of the cord, because these two always take place in opposite directions.

Now, when the radius of the drum is less than that of the upper wheel, the translatory motion is necessarily the larger, because the linear motion of the circumference of the drum is less than that of the circumference of the upper wheel, which is the same as that of the tyre of the driving wheel, which, in its turn, is equal to the translatory motion of the whole sytem. Thus the motion of P towards the operator being equal to the difference between this translatory motion and the linear motion of the drum, and it being necessary that the greater of these two components should be in the direction of the applied force, the machine must move towards the operator, if the radius of the drum be less than that of the upper wheel. On the other hand, it will move in the opposite direction if these radii have the reverse relation; and if they are equal it will remain at rest, notwithstanding any amount of amazement on the part of the spectators.—ED M. M.]

SPECIFICATIONS OF PATENTS RECENTLY FILED.

COWLEY JOHN, of Quennington Paper Mills, Gloucestershire, and DANIEL PEYTON SULLIVAN, of Stockwell, Surrey. *Improvements in the manufacture of paper.* Patent dated April 16, 1855. (No. 836.)

Claims.—1. The use of caustic soda liquors of a strength not exceeding four degrees, as indicated by the ordinary English glass, used in the manner described, for the manufacture of pulp from straw or other similar vegetable fibrous matter. 2. The use of superheated steam for the purpose of more effectually disintegrating the straw or other vegetable matter, together with a mechanical arrangement for effecting the same. 3. A mode of washing the straw or other vegetable pulp prior to bleaching, and a mechanical arrangement for effecting the same. 4. A method of bleaching the straw or other vegetable pulp; also the use of steam during the process, and the use of bleaching liquor at the strength of from $1\frac{1}{4}^{\circ}$ to 2°. 5. Several described improvements in the heating engine.

BEARD, GEORGE, of Birmingham, Warwick, manufacturer. *An improved label and stamp setter.* Patent dated April 16, 1855. (No. 837.)

On a suitable sole plate is affixed a water box, with a cushion at top, and a sponge or other means of raising the fluid so as to keep the cushion wet. Above the cushion is a small platten at the end of a plunger (working in a suitable guide) to be actuated by the pressure of the fingers. On the same sole plate is another box provided with a lock and key, for the reception of the labels, tickets, or stamps, &c.

DEVY, PHILIPPE AMEDEE, of Old Jewry Chambers, Old Jewry. *Improvements in the frames of swing looking-glasses.* (A communication.) Patent dated April 17, 1855. (No. 841.)

This invention consists of a method of swinging two glasses, so that the back as well as the front of the head, &c. may be seen.

MILLIGAN, ROBERT, of Harden, Bingley, York, manufacturer. *An improvement in the manufacture of woven fabrics made of wool, mohair, or alpaca.* Patent dated April 17, 1855. (No. 842.)

This invention consists in weaving fabrics, when made of wool, or mohair, or alpaca, or partly of either of these fabrics, by employing worsted yarn (where the fibres are laid longitudinally in the yarn) as weft for some parts of the fabric, and woollen yarn as weft for other parts of the fabric; the warp being worsted or other suitable yarn. The fabric, so woven, has the appearance of being partly of crape and partly of Orleans cloth.

WILSON, GEORGE FERGUSSON, of Belmont, Vauxhall, and WARREN DE LA RUE, of Bunhill-row. *Improvements in combining fluids to be burned in lamps.* Patent dated April 17, 1855. (No. 843.)

This invention consists in combining glycerine with alcohol, or with wood spirit, or with both, or with a mixture of either with fusel oil.

CRAPELET, CHARLES, of Rue des Fossés, Montmartre, Paris. *Improvements in the construction of tompions for cannon and other fire-arms, which improvements are applicable to stopping bottles and other vessels.* Patent dated April 17, 1855. (No. 844.)

This invention consists in introducing into the orifice to be closed a plug of vulcanized India rubber, or other suitable elastic substance, in such a manner that the plug may, after insertion, be compressed longitudinally by means of a screw, or otherwise, and the diameter of it thus increased until it tightly fits the orifice.

ALLEN, EDWARD ELLIS, of the Strand, Middlesex, engineer. *Improvements in steam engines.* Patent dated April 17, 1855. (No. 845.)

A description of these improvements was published on page 120 of the current volume, (No. 1670) for August 11, 1855.

LEVY, PHILLIP, of Edinburgh, furrier to Her Majesty. *An improved wrapper for travelling and personal wear.* Patent dated April 17, 1855. (No. 846.)

This invention consists in constructing a wrapper or garment which shall not only protect the knees, but also the feet, legs, loins, and body as far as the waist. "For this purpose," says the inventor, "I construct a sack or bag, which extends upwards at back, in such manner that when the feet and legs are inserted therein it shall come up to the thighs of the wearer; but I continue the wrapper upwards in front, so that it shall come up to the waist, while the sides, which are not united at back to a greater height than the thighs, as before named, wrap round the loins and back, or are placed at the sides, according to the desire of the wearer. I make these wrappers in any woollen or other suitable warm material, and line them or not according to circumstances, with fur or other warm soft material."

WODEHOUSE, HENRY, of Stafford, engineer. *Improvements in the construction of crossings for the permanent way of railways.* Patent dated April 18, 1855. (No. 849.)

This invention consists in so constructing the rails of crossings that when one part of the wing rail is injured by wear, it may be

reversed so as to bring another portion in the place of it; also in substituting the check rails for the wing rails, and using them in the same way.

KAY, JOHN, of Bonhill, Dumbarton, calico-printer. *Improvements in preparing and printing textile fabrics and other surfaces.* Patent dated April 18, 1855. (No. 853.)

This invention consists in the use, in machines for printing textile fabrics, of apparatus for stretching and cleaning the fabric, such apparatus consisting of a pair of rollers acting on opposite sides of the fabric, each of which rollers is formed with right and left-handed helical blades.

BRIDGE, RICHARD, of Chadderton, Lancaster, manufacturer. *Certain improvements in power looms.* Patent dated April 18, 1855. (No. 854.)

This invention consists in the use of small metallic levers, acted upon by springs, in lieu of, and for similar purposes as, "check straps."

MADELEY, WILLIAM, of Manchester, Lancaster, machinist, and THOMAS HANLON, of the same place, mechanic. *An improvement in or applicable to power looms.* Patent dated April 18, 1855. (No. 857.)

Claim.—The application of a lever worked by the crank arm, which lever, by acting upon the top piece, relieves the shuttle immediately before it receives the blow of the picking rod, from the pressure of the swell or part which tends to retain it in the shuttle box.

LAWSON, JOHN, of Leeds, York, machine-maker, and SOMERVILLE DEAR, of the same place, machine-maker. *Improvements in machinery for combing and cleaning flax, tow, wool, and cotton, and other fibrous substances.* Patent dated April 18, 1855. (No. 858.)

The operation of the machine described by the inventor, is as follows:—The sliver is passed through a set of retaining rollers, such as are used in a common drawing frame. A faller is lifted up from the lower or first set of screws to the second set of screws, and the hackle passes into the sliver close to the retaining rollers. The faller is then propelled forward by this part of the screw at a greater speed than that at which the retaining rollers give out the sliver, so as to keep the sliver extended for the impingement of the next or following hackle, the fallers following each other continuously, &c.

LEES, THOMAS, of Birmingham, Warwick, manufacturer. *An improvement or improvements in metallic pens.* Patent dated April 19, 1855. (No. 863.)

This invention consists, says the inventor, "in the use of malleable cast iron for the manufacture of pens. By malleable cast iron I wish it to be understood, that I mean such cast iron as becomes malleable after having been heated or annealed in contact with powdered hæmatite or peroxide of iron."

HOWES, EDWARD, of Birmingham, Warwick, manufacturer, and WALTER HOWES, of Birmingham, manufacturer. *Improvements in carriage lamps.* Patent dated April 19, 1855. (No. 864.)

This invention consists of a method of attaching carriage lamps to carriages, by forming in the bottom of the lamp a staple, into which an arm attached to the carriage enters, and is fixed by a screw, and in securing the nozzles of carriage lamps in their places by means of a spring catch fastening.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improved machinery for crushing and grinding mineral and other substances.* (A communication.) Patent dated April 19, 1855. (No. 868.)

Claim.—Combining with a rotating pan or shell, having a rim against which the substance to be crushed or ground is distributed and held by centrifugal force, one or more wheels with rounded or bevelled treads, and turning on axes radiating, or nearly so, from the axis of the pan or shell.

CONGREVE, CHARLES M'ILVAINE, merchant, of New York, United States of America. *Improvements in the manufacture of iron when oxide iron ores are used.* (A communication.) Patent dated April 19, 1855. (No. 869.)

This invention consists in feeding oxide iron ores by a screw from a hopper, into a slowly revolving cylinder, which is externally heated by the heat and products of combustion passing off from a reverberatory furnace below. The ore is in a reduced state, and mixed with a quantity of carbon, when fed into the cylinder.

JONES, WILLIAM, of Rhodes, near Middleton, Lancaster, machine printer. *Improvements in printing calico and other fabrics.* Patent dated April 19, 1855. (No. 870.)

Claim.—"The use of rollers working in slides or on levers free to move and act upon the grey or black cloth for the purpose of regulating the tension of the said grey or black cloth, which is used as a substitute for blanket in machines for printing calico, muslin-de-laine, or other fibrous substance."

LEAR, PETER, of Boston, Massachusetts, United States of America. *An improved method of arranging and operating horizontal submerged propellers.* Patent dated April 19, 1855. (No. 871.)

This invention consists in opening a passage into the centre of the wheel-case

for the admission of air, and in the use of a deflector or guard in advance of the wheel, by means of which the water is caused to leave the wheel-case in a direction very nearly parallel to the course of the vessel, while the air which is drawn into the wheel-case by the centrifugal action of the paddles displaces a portion of the water which would otherwise obstruct the motion.

JACOT, FRANÇOIS, of Rue du Jeuneuse, Paris. *An improvement in the manufacture of starch, and in obtaining and treating the gluten.* Patent dated April 19, 1855. (No. 872.)

Claim.—Subjecting the gluten obtained in the manufacture of starch to heat, so as to reduce it to a state in which it can be kneaded and mixed with dough.

SAVORY, WILLIAM, engineer, of Gloucester. *Improvements in machinery for crushing grain and other substances, and for cutting chaff.* Patent dated April 19, 1855. (No. 873.)

On either side of a grooved pulley, and near the periphery, the inventor places two rollers (cylindrical or conical, grooved or plain) which are pressed up to the sides of the pulley, by springs or otherwise, so that by the rotation of the pulley the two crushing rollers will be put in motion by surface contact with the sides of the pulley.

ATHERTON, JOHN, of Preston, Lancaster, machine-maker, WILLIAM BOYES, of the same place, manufacturer, and WILLIAM LANCASTER, of the same place, manufacturer. *Improvements in temples employed in the manufacture of textile fabrics.* Patent dated April 19, 1855. (No. 874.)

This invention consists of several improvements in the temples employed for distending textile fabrics breadthwise while they are manufactured, &c., &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of articles of hard India-rubber or gutta percha, or compounds thereof, and in coating or covering articles with the like materials.* (A communication.) Patent dated April 19, 1855. (No. 875.)

This invention consists in the manufacture of articles by first moulding them, while in a soft state, and then submitting them to a high degree of heat in steam heaters, or to the action of a sulphur bath.

PEARCE, JOHN CHARLES, of the Bowling Iron-works, near Bradford, York, engineer. *Improvements in making the joints of pipes, and other articles.* Patent dated April 20, 1855. (No. 877.)

This invention consists in the use of "rings or other shaped packings, made of corrugated metal or other material, for making steam, air, gas, or water-tight joints of pipes, and other articles."

RYDER, WILLIAM, of Bolton-le-Moors, Lancaster, spindle and flyer maker. *Improvements in certain machinery for slubbing and roving cotton and other fibrous substances* Patent dated April 20, 1855. (No. 879.)

Claims.—1. The application and use of friction for giving pressure to the pressers of flyers. 2. Constructing the fingers of pressers of hollow sheet metal.

MACÉ, HYPOLITE, of Paris, France, merchant. *Improvements in transferring colours or metals in design, on and from paper and stone, on to surfaces.* (A communication.) Patent dated April 20, 1855. (No 880.)

Claims. 1. "The use of the paper for representing or transferring drawings or designs prepared as described. 2. The use of the varnish or geaze prepared as described. 3. The combinations and process described, by which immission of the proofs is obtained, and transfer of designs or drawings on to surfaces is completed."

MAURICE, CLAUDE LAURENT VICTOR, civil engineer, of St. Etienne, Loire, French Empire. *Certain improvements in carbonizing coal, and in apparatus to be employed therein.* Patent dated April 20, 1855. (No. 881.)

This invention mainly consists in the introduction, between the charge of coal and the vault or roof of the coke oven, of a series of jets of air, directed upwards towards the top of the oven, and at such a height as not to impinge upon the charge.

LISTER, SAMUEL CUNLIFFE, of Bradford, York, manufacturer. *Improvements in treating the rhea-plant, so as better to prepare its fibres before being spun.* Patent dated April 20, 1855. (No. 884.)

"I have discovered," says the inventor, "that by simply passing it (the rhea-plant) through rollers, with pressure, in the same manner that flax has been treated, good results may be obtained, as it will, to some extent, remove the bark, and at the same time, loosen the fibres, and when hackled, the remaining portion of the bark will be removed by the teeth of the hackle."

ALLEN, HORATIO, of the Novelty Iron-works, New York, United States of America, civil engineer. *Improvements in the valves of steam and other engines.* Patent dated April 20, 1855. (No. 885.)

Claim.—So constructing a cone valve that in the operation of opening and closing the same, two motions shall be imparted to it in, or nearly in succession, and in directions at a right angle with each other, the first effecting the withdrawal of the valve from contact with its seat, and retaining it so withdrawn while the second motion shall be given, whereby it can by the second motion be turned without friction, and this irrespective of the peculiar mechanism employed.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Foster, Cranston, of Warrington, Lancaster, machinist. *Certain improvements in effecting communication by signals upon railways, and in the apparatus connected therewith.* Application dated April 17, 1855. (No. 848.)

This invention consists in communicating railway signals by means of coloured lamps worked by inclined planes or treddles.

Danchell, Frederick Ludewick Han, of Arthur-terrace, Caledonian-road, Middlesex, engineer. *Improvements in apparatus for increasing, exhausting, or regulating fluids and indicating pressure.* Application dated April 18, 1855. (No. 850.)

In this invention jets of steam are made to pass into an open tube, "into which tube an orifice is made communicating with the vessel or vessels to be exhausted, producing in them the corresponding amount of exhaustion, for such purposes as may be required in proportion to the velocity and force of the jets."

Dameron, Louis, of Paris, coach manufacturer. *Improvements in the construction of carriages.* Application dated April 18, 1855. (No. 851.)

The inventor describes a carriage capable of being converted into three different forms.

Fordred, John, of Hampstead, Middlesex, gentleman. *Improvements in the production of reflecting surfaces, and in the application of reflecting surfaces to decorative and useful purposes.* Application dated April 18, 1855. (No. 852.)

This invention consists in the employment of certain metal leaf, &c., in the production of reflecting surfaces, and in the application of such surfaces to the construction of lamps, shop-lights, &c.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for moulding and casting fusible or plastic materials, and in covering or coating articles with such materials.* (A communication.) Application dated April 18, 1855. (No. 855.)

According to one arrangement of this invention, the India-rubber (if such be the material employed), is contained in a horizontal cylinder, and is kept in a melted or plastic state by means of a steam or hot-water jacket placed round the cylinder, the water in the jacket being heated by a small fire-place below it. The India-rubber is forced out of one end of the cylinder into any suitable mould by means of a plunger on the end of a screwed shaft, which works through a fixed nut, and is rotated by a suitable fly-wheel, &c.

Cook, Benjamin, engineer, of Summer-row, Birmingham, Warwick. *Certain improvements in the construction of horse-shoes, and which said improvements are also applicable to the shoeing of asses, mules, and oxen, when such are used as animals of draught, such shoes being applied in each case without the use of nails.* Application dated April 18, 1855. (No. 856.)

This invention consists in making the shoes mentioned in two parts, united at the toes or heels, such parts having projections on the outer edges for the purpose of clipping the hoofs; and in a mode of securing this construction of shoe by a small cross-bar, lying across the back, or in the hollow of the hoof.

Russell, Frederick, of Cumberland-market, Regent's-park, Middlesex, mechanic. *Improvements in hanging-window sashes.* Application dated April 18, 1855. (No. 859.)

In carrying out this invention, which is intended to supply the place of sash lines, the inventor places on one side of a sash rollers, which, when the sash is raised or lowered move freely against one side of the window frame. On the other side is formed a recess, in which moves a sliding piece faced with leather, and pressed forward by a spring against the side of the sash.

Harvey, Henry, of Denbigh-street, Pimlico, Middlesex, gentleman. *The application of cork, in all its forms, in the manufacture of beds, mattresses, cushions, and seats.* Application dated April 18, 1855. (No. 860.)

This invention consists in "the application of cork, either in bark, shavings, or cuttings, to the stuffing, casing, and lining of beds, mattresses, pillows, cushions and seats."

Edwards, William Vaughan, of Swindon, Wilts, ironmonger. *An improved economic portable boiler and cooking apparatus.* Application dated April 18, 1855. (No. 861.)

This apparatus consists of one or more metal pipes, tubes, or funnels, introduced vertically or otherwise into a boiler made of metal, whereby an increased amount of heating surface is obtained, the tubes, pipes or funnels also acting as chimneys.

Pallier, Dumont, of Broad-street Lambeth, Surrey, grease manufacturer, and Edward Taylor, of the same place, manufacturing chemist. *Improvements in the manufacture of soap.* Application dated April 19, 1855. (No. 862.)

The inventors employ, in manufacturing soap, chloride of lime, and a composition made of farinaceous vegetables, resin, and sulphate of soda mixed in water.

JACKSON, THOMAS, of Commercial-road, Pimlico, Middlesex, contractor for public works. *Improvements in signals for railway trains.* Application dated April 19, 1855. (No. 865.)

This invention consists in the use for railway signals of any suitable detonating compound to be exploded by the guard when he wishes to attract the attention of the engine driver, &c.

HINDLE, JAMES, of Accrington, Lancaster, machine printer. *Improvements in machinery or apparatus used in the process of printing woven fabrics.* Application dated April 19, 1855. (No. 866.)

This invention "consists in cleansing the blanket whilst the machine is in motion by passing it between rollers revolving in water or any suitable liquid, and then drying it by means of heated cylinders and steam chests, and then conveying it to the printing process perfectly cleansed."

BISHOP, WILLIAM, of Old Fish-street-hill, Upper Thames-street, London, stationer. *An improved mode of ornamenting writing papers.* Application dated April 19, 1855. (No. 867.)

This invention relates to a mode of ornamenting the surface of writing papers by printing patterns upon the paper in pale flat tints which shall harmonize with the colour of the paper, and so contrast with the colour of writing ink as not to interfere with the legibility of any writing executed upon them.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in railway brakes.* (A communication.) Application dated April 19, 1855. (No. 876.)

In carrying out this invention, the first and last axle of each carriage is acted upon by a pair of brakes, and these brakes consist each of a cast-iron box fitted to slide along a rack which is jointed at its upper end to a fixed eye secured to the cross beams of the carriage framing. Inside each box is fitted a toothed pinion gearing with the racks, these pinions serving to lengthen the brake, and so bring its foot in contact with the rail when the carriage is to be stopped.

TARDIEU, LUCIEN, of Rue de l'Echiquier, Paris, France, gentleman. *A new mode of producing letters and figures for signs, show-boards, fronts of shops, houses, and other places.* Application dated April 20, 1855. (No. 878.)

This invention consists in a new arrangement of letters, signs, decorations and other figures in relief, made of glass, porcelain or other transparent substance, and in introducing a light for rendering them visible at night.

MANNING, JAMES ALEXANDER, of the Inner Temple, Middlesex, esquire. *Improvements in effecting the agitation of fluids, and solid matters contained therein.* Application dated April 20, 1855. (No. 882.)

This invention relates to the use of aeriform currents for the purpose of causing agitation in fluids, &c. It is carried out in practice by passing an air pipe or pipes down into the mass of matter to be agitated.

LORD, JOHN, of Rochdale, Lancaster, manufacturer. *Improvements in temples for power-looms.* Application dated April 20, 1855. (No. 883.)

These improvements mainly consist in the employment of three small rollers or cylinders (through or between which the woven fabric passes), placed at each side of the loom, each set being arranged so that two of the rollers may be below the upper one.

BENNETT, WILLIAM LEE, of Wolston, Warwick, gentleman. *An improvement or improvements in seed-drills.* Application dated April 20, 1855. (No. 887.)

The improved drill "consists of a shaft to which is attached a wheel. A hopper containing the seed deposits it, when of a certain description, in holes in a drum, whence it is deposited in a conductor which drops it into the earth."

PROVISIONAL PROTECTIONS.

Dated September 8, 1855.

2032. Robert Barnard Feather, of Liverpool, Lancaster, gentleman. Improvements in the make and construction of shells and balls to be used with cannon, or other artillery, or fire-arms.

Dated September 18, 1855.

2104. James Dellagana, of Red Lion-street, Clerkenwell, Middlesex, stereotype founder. Stereotyping type high, that is to say, as high as common printing type, or seven eighths of an inch high.

Dated October 9, 1855.

2259. Narcisse Leroy, of Rue de l'Eglise, Batignolles, Paris, railway contractor. Improvements in the construction of railway carriages.

Dated October 11, 1855.

2273. William Andrew Fairbairn, of Manchester, engineer, and George Haslem, of the said city, mechanic. Improvements applicable to locomotive engines and carriages.

2275. Peter Spence, of Pendleton, Lancaster, manufacturing chemist. Improvements in the production of sulphate of alumina to be used in the fluid state, or to be rendered into the solid condition, known commercially as cake alum.

2277. John King Westrop, of Staining-lane, and Edward Alfred Sharman, of Noble-street, London. An improvement in the manufacture of gloves made of looped fabrics of silk, cotton, and linen.

Dated October 12, 1855.

2281. Robert Henry Kay and Alfred Thomas Richardson, manufacturers, and George Mallinson,

pattern designer, of Manchester. Improvements in the manufacture of plain and ornamental woven fabrics.

2283. William Lyall, of Amiens, French Empire, flax spinner. Improvements in spinning machinery, applicable also to roving machinery.

2285. Henry Gardner, of Oldner Farm, Chipping Norton. Improvements in machinery for dressing or cleaning wheat, grain, and seeds.

2287. Adolph Staadt, of Grande-place, Brussels, Belgium. Improvements in obtaining motive power when gravity and steam or expansive fluids are used. Partly a communication from Bernard Schroeder.

Dated October 13, 1855.

2289. Hugh Greaves, of New Palace-yard, Westminster, civil engineer. Improvements in the construction of steam boilers.

2293. Louis Ullrich, of Prague, Bohemia. Improvements in the means of indicating the number of persons entering an omnibus or other carriage, any theatre, or other building.

2295. Thomas and William Hemsley, of Melbourne, near Derby. An improvement in the manufacture of embossed and craped fabrics.

2297. Manuel Perez Lozano, of Crutched Friars, London. Improvements in treating pyrites and ores containing sulphur, in obtaining sulphuretted hydrogen, and in precipitating copper from solutions. A communication.

2299. John Stenhouse, of Upper Barnsbury-street, Islington. Improvements in the preparation of decolorising materials.

Dated October 15, 1855.

2303. Samuel Kent, of Liverpool, Lancaster, bookseller. Improvements in purifying and measuring water, parts of which are applicable to measuring other fluids.

2305. James Miller Brown and Thomas Brown, of Piccadilly. Improvements in the manufacture of folding chairs.

Dated October 16, 1855.

2307. Lewis Normandy, of Judd-street, Brunswick-square, civil engineer. Improvements in the mode of writing and printing music, to facilitate the study thereof. A communication from l'Abbé Eugène Cormier.

2311. Edwin Wilkinson, of Woodhouse, York. An improved mode of extracting grease from woollen, cotton, and worsted waste.

2313. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the construction of fire-arms. A communication.

2315. James Fraser, of Jermyn-street, Middlesex, gentleman. An improvement in the manufacture of paper or paper pulp. A communication.

Dated October 17, 1855.

2317. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of anchors.

2319. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of railway bars.

2320. William Thomson, of Perth, carriage builder. Improvements in four-wheeled carriages.

2321. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of cast steel.

2323. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in metal beams, girders, and tension bars, used in the construction of roofs, floors, and other parts of buildings, and in the construction of viaducts and suspension and other bridges.

2325. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of ordnance, and in the projectiles to be used therewith.

2327. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of railway wheels.

2329. John Talbot Pitman, of Gracechurch-street, London. An improvement in fire-arms. A communication from James H. Merrill, of Baltimore, United States.

2331. John Adcock, of Marlborough-road, Dalston, Middlesex, mechanician. Improved apparatus for measuring and indicating the distance travelled by ships or other vessels.

Dated October 18, 1855.

2333. Charles Edwin Jones, of Huddersfield, York, gentleman. Certain improvements in machinery for raising water and other liquids by means of a combination of the principle of the accumulation of force, by compression of air or other elastic fluids and that of centrifugal force, the more readily to obtain increased mechanical power thereby.

2335. William Glass, analytical chemist, Dahlia-cottages, Millwall, Poplar. Improvements in obtaining a deodorizing and disinfecting material.

2337. Doctor Graham, of Over Darwen, Lancaster, manufacturer. Improvements in the manufacture of paper hangings, and in machinery to be used in such manufacture. A communication.

2339. John Cheesman Wagstaff, of Grosvenor-street, Middlesex. Improvements in the manufacture of seamless garments and other seamless fabrics. Partly a communication.

Dated October 19, 1855.

2341. John Smith, of Brydges-street, Covent-garden, Middlesex, gentleman. Improvements in the construction of bedsteads, such improvements being applicable to carriages, ambulances, and other articles.

2347. Henry Giller, of Southampton-street, Westminster, manufacturer. An improvement in globes and shades for gas and other lights.

2349. William Field and Edward Jeffreys, of Shrewsbury, Salop, gentleman. Improved means for securing the rails of railways in their chairs or bearings.

Dated October 20, 1855.

2351. Pierre Arnaud Massip, of Rue de l'Echiquier, Paris, gentleman. A machine for preparing hat linings. A communication from Désir Birac, of New Orleans.

2353. Nathaniel Shattswell Dodge, of St. Paul's-churchyard, London, merchant and India-rubber cloth manufacturer. Improvements in machinery or apparatus for spreading or distributing waterproofing, or similar compositions, over webs or sheets. A communication.

2355. Frederic Whitaker, of Murray-street, New North-road. Improvements in the construction of sewing-machines.

2357. Henry Woodrow, of Wood-street, Cheapside, London, shirt manufacturer. Improvements in shirts.

Dated October 22, 1855.

2363. Vincent Scully, Esq., and Bennett John Heywood, gentleman, of Dublin. Improvements in clips or holders for suspending railway tickets and other small articles.

Dated October 23, 1855.

2365. William Wilson, of Manchester, agricultural implement maker. Certain improvements in machinery for crushing grain and other substances.

2367. Adolphus Oppenheimer, of Manchester, Lancaster, manufacturer. Certain improvements in machinery or apparatus for stretching or distending velvets and other piled goods or fabrics for the purpose of cutting the pile of such goods.

2371. Thomas Richardson, of Portland-place, Newcastle-on-Tyne. Improvements in the manufacture of glass and clay-wares.

2373. Henry Weber, mechanician, of Zurich, in the Swiss Confederation. Certain improvements in apparatus for motive power.

Dated October 24, 1855.

2377. Jacques Rives, of Boulevard St. Martin, Paris. Improvements in looms for weaving.

2379. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in lamps. A communication from Abraham Coates, New York, United States.

2381. John Edward Mayall, of Regent-street, Middlesex, photographic artist. Improvements in photography.

2383. Charles Crickmay, of Lambeth, Surrey, and Frederic Joseph Clowes, of Camberwell. Improvements in the manufacture of guns, pistols, and gun stocks, and in cutting and carving wood, metals, and minerals, and other materials by machinery.

2385. Eugène Hippolyte Rascal, of Catherine-street, Strand, Middlesex. Improvements in apparatus used in the manufacture of type and other articles for letter-press printing. A communication.

Dated October 25, 1855.

2387. Henry Tritton, of Great Grimsby, Lincolnshire, esquire. An improved safety apparatus for the protection of persons while painting the exterior of buildings and cleaning windows, which may be used as a balcony for holding flowers.

2389. James Platt, of Oldham, Lancaster, mechanical engineer, and John Whitehead, of the same place, foreman. Improvements in machinery or apparatus for preparing clay for the manufacture of bricks.

2391. John Andrew Richards, of Tyer's-gateway, Bermondsey-street, Surrey. Improvements in producing the hard grain on leather.

Dated October 26, 1855.

2393. John Pinches, of Oxendon-street, Haymarket, Middlesex, die-sinker. Improvements in the construction of dies or stamps for marking papers, linen, or other substances.

2395. Edwin Pugh, of Chatham, Kent. Safety alarum and signal-apparatus.

Dated October 27, 1855.

2399. Simon O'Regan, of Liverpool, Lancaster, engineer. Improvements in marine engine boilers, and other boilers and their furnaces.

2401. John Ashton, of Oldham, Lancashire. Improvements in certain parts of machinery known as "self-actors" (employed for spinning and doubling cotton and other fibrous materials), for more effectually crossing the yarn during the shaping or building of the "cops," than heretofore.

2403. Peter Cranke Wood, of Guildford-street East, Middlesex, mineral surveyor. Improved machinery for preparing or scutching flax, and other analogous fibrous substances. A communication.

2405. Edwin Tomlinson, of Barns Cray, Crayford, Kent, and Alfred Mortimer Job, of Islington, Middlesex, waterproofers. Improvements in waterproofing skins of animals.

2407. Alfred Abel, of Spring-street, Sussex-gardens, Hyde-park, dentist. Improvements in stopping, filling, or plugging teeth, and in instruments to be used therefor.

Dated October 29, 1855.

2416. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in breaks for railway carriages. A communication.

Dated October 31, 1855.

2424. Robert Griffiths, journeyman joiner, Lower Broughton, Manchester, Lancaster. A compound and exact measurement tap, applicable to the measurement of every kind of liquor or liquid.

2426. Thomas Webster Rammell, of Trafalgar-square, Middlesex. Improvements in preparing black lead, chalk, and other materials used for drawing, writing, and marking.

2428. George F. Woolston, of Washington, United States. Improvements in cutting and planing wood.

2430. Thomas Shipp Grimwade, of Harrow, Middlesex, farmer. Improvements in treating milk in order to preserve it.

2432. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in the manufacture of gas. A communication.

Dated November 1, 1855.

2434. Henry Barber Beaumont, of Gloucester-terrace, Hyde Park, gentleman. Improvements in portable dwellings or huts, vehicles and boxes, or packing materials for travellers.

2436. Richard Reeves Cox, of Fareham, Hants, coal merchant. Improvements in the manufacture of artificial fuel.

2438. David Louis Antoine Nicole, of Chichester-place, King's-cross. Improvements in apparatus for winding up watches.

2440. John Pinches, of Oxendon-street, Haymarket, Middlesex, die sinker. An improved machine or apparatus for embossing paper, metal, and other substances by hand.

2444. Lewis Normandy, of Judd-street, Brunswick-square, Middlesex, civil engineer. Improvements in securing the rails in railways. A communication.

2446. Edwin Thomas Truman, of Old Burlington-street, Middlesex, dentist. Improvements in palates or holders for artificial teeth.

Dated November 2, 1855.

2448. John Cottrill, of Great Lever, near Bolton, Lancaster, bleacher. Improvements in machinery or apparatus for washing, scouring, dyeing, sizing, and cleaning woven fabrics and yarns.

2450. John Patterson, of Beverley, York, engineer. Improvements in mills or machines for grinding, crushing, cutting, and hulling or shelling various kinds of farm produce, and also for crushing and grinding minerals and other substances.

2453. Werner Staufen, of Baker-street, Portman-square, Middlesex. A substitute for hair and other substances commonly employed for stuffing cushions, furniture, and other articles.

Dated November 3, 1855.

2456. James Smith Cottrill, of Great Lever, near Bolton, Lancaster, bleacher. Improvements in machinery or apparatus for washing, scouring, dyeing, sizing, and cleaning woven fabrics and yarns.

2458. James Eastwood, of Mill House, Midgley, York, worsted spinner and manufacturer. Certain machinery or apparatus for taking out the slubs, noils, and knots from worsted sliver, slubbing, and roving.

2460. George Davis, of Southampton, plumber. Improvements in apparatus for letting in or shutting off water or other liquids.

2462. William Robertson, of Oakfield Foundry, iron founder, and James Henry, machine maker, of Edinburgh, Scotland. Improvements in machinery for reaping and mowing corn or other agricultural produce.

2464. James Greenshields, of Glasgow, Lanark, manufacturer. Improvements in the manufacture or production of drying oleaginous compounds.

2466. William Gardner, of Droylesden, Lancaster, watch manufacturer. An improved method of manufacturing watches or other time-keepers, and also improvements in the machinery, tools, or apparatus for accomplishing the same.

2468. Fennell Allman, of Cambridge-terrace, Middlesex, consulting engineer. Certain improvements in apparatus for the production of steam.

2470. George Collier, of Halifax, York. Improvements in weaving carpets and other pile fabrics.

2472. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in generating motive power. A communication.

Dated November 5, 1855.

2474. John Hicks, of Bedford-place, Clapham Rise, Surrey, civil engineer. An improved gauge valve, applicable to boilers of steam engines, and to other purposes.

2476. Francis Hawkes the elder, surveyor, of West-street, Reading, Berks. Improvements in the construction and arrangement of water closet apparatus.

2478. Henry Clinton Page, of Commercial-road, South Pimlico, Middlesex, sculptor. An improved method of indurating marble and stone, and of permanently fixing colors therein, when coloring matters are applied thereto for producing a variegated pattern or device on the surface thereof.

2480. Maurice Guillemot, of Paris, France Certain improvements in stopping horses.

2482. Peter McGregor, of Dumbarton, joiner. Improvements in water-closets.

2484. Thomas Thomas the younger, of Bristol, soap manufacturer. Improvements in the manufacture of soap.

2486. Alexander Charles Louis Devaux, of King William-street, London, merchant. Improvements in the construction and the fitting up of granaries.

Dated November 6, 1855.

2488. Joseph Jessop, of Lascelles Hall, near Huddersfield, York, manufacturing chemist. Improvements in the construction of furnaces and boilers.

2490. Richard Goose, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of cut nails.

2492. Richard Threlfall, of Preston, Lancaster, cotton spinner, and John Higson, of the same place, manager. Improvements in machinery or apparatus used in preparing or sizeing and dressing yarns for weaving.

2494. Anthony Dugdale, of Rue Ponthieu, Paris, France, engineer. Improvements in the construction of locomotive engines applicable in part to marine and stationary engines.

Dated November 7, 1855.

2496. George Cotsell, of Brompton, Kent. An improved gutter and kerb for roads and streets.

2498. Charles Hart, of Wantage, Berkshire, agricultural engineer. Improvements in threshing and dressing machines.

2500. Frederick Scholefield, of Manchester, Lancaster, machinist. Improvements in machinery or apparatus for cutting paper, cardboard, and similar materials.

2504. Louis Benoit Advielle, of Paris, merchant. An improved process for silvering metallic articles.

2506. John Wakefield, of Inchicore Works, Dublin, engineer. Improvements in machinery for working the slides and steam-valves of engines driven by steam or other elastic fluid.

2508. Charles Marie Pouillet, civil engineer, of *Paris*, French Empire. Certain improvements in *railways*.

2510. Thomas Godding, of Ipswich, Suffolk, stay maker. Improvements in the fastening for stays, corsets, and bands.

2514. Charles William Siemens, of the Adelphi. Improvements in evaporating brine and other liquids and in distillation.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2519. Cullen Whipple, of the United States of America. Improvements in machinery for preparing and combing fibrous materials. November 8.

2533. Ephraim Green and Jacob Green, of West Bromwich, Stafford, ironfounders. Improvements in malt crushers. November 10.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November 20th,* 1855.)

1522. John Gedge. Improvements in aerated waters. A communication.

1541. Richard Archibald Brooman. An improved means of securing wheels upon axles. A communication.

1543. Charles James Cheatley Elkington. Improvements in depositing alloys of metals.

1544. Henry Pratt. Certain improvements in steam flour mills, wind mills, and water mills, parts of which are also applicable for other useful purposes. Partly a communication.

1552. Thomas Wright Gardener Treeby. Improvements in revolving fire-arms and cannon.

1556. William Williams. Improvements in the manufacture of bricks, pipes, and tiles.

1557. Benjamin Greening. Improvements in machinery for washing and mangling, parts of which are applicable to churning.

1565. Romain Denis Obissier. Improvements in obtaining motive power by hydraulic means.

1574. Eugène Gillet. Improvements in fixing artificial teeth.

1583. Louis Constant Joseph Pollesse, junior, and Charles Auguste Joseph Lengelée. Improvements in the manufacture of encaustic matters.

1591. Antoine Regazzoli. Impelling railway carriages up ascents. A communication.

1592. Ludovico Gavioli. A new or improved musical instrument, called clavi-accord.

1595. James Newman and William Whittle. Improvements in the manufacture of axles.

1598. Pierre Laroche. Improvements in rotatory steam engines.

1624. Robert Martin and John Cowdery Martin. An improvement in obtaining pulp from wood.

1634. John Henry Johnson. Improvements in apparatus for actuating railway breaks. A communication.

1642. John Henry Johnson. Improvements in machinery or apparatus for obtaining motive power, applicable also to the raising, forcing, and exhausting air and other fluids, and partly to the kneading or working of dough or other pastes. A communication.

1648. William Striby. A new and improved system of musical notation.

1658. James Tildesley. An improvement or improvements in curry-combs.

1681. Tony Petitjean. Improvements in silvering, gilding, and platinizing glass.

1711. Charles Felton Kirkman. Certain improvements in machinery for spinning and twisting cotton, silk, flax, wool, hemp, and other fibrous substances.

1730. William Truran. Improvements in smelting, and in apparatus to be used therein.

1734. Herbert Mackworth. Improvements in washing and separating minerals and other substances in a granular or pulverulent state.

1782. John Lilley. Improvements in obtaining textile fibres, and in the manufacture of pulp and dye.
1816. Auguste Morin. Improvements in the manufacture of artificial fuel.
1843. Mark Mellor. Certain improvements in self-acting mules.
1905. Wright Jones. Improvements in machinery or apparatus for printing woven fabrics and paper-hangings.
2103. Charles Tilston Bright and Edward Brailsford Bright. Improvements in electric telegraphs, and in apparatus connected therewith.
2111. James Willis. Improvements in the construction of umbrella and parasol furniture.
2150. Thomas Deakin. New or improved machinery for manufacturing bayonets, matchets, and swords.
2173. David Chadwick, Herbert Frost, George Hanson, and John Chadwick. Improvements in apparatus for measuring water and other fluids and gas, applicable also as a motive-power engine.
2208. John Dickinson. An improvement in the manufacture of paper.
2237. James Torry Hester. Improvements in invalid and children's chairs.
2278. Richard Albert Tilghman. Improvements in treating fatty and oily substances.
2285. Henry Gardner. Improvements in machinery for dressing or cleaning wheat, grain, and seeds.
2295. Thomas and William Hemsley. An improvement in the manufacture of embossed and craped fabrics.
2296. George Tomlinson Bousfield. Improvements in power looms. A communication.
2298. George Tomlinson Bousfield. Improvements in looms suitable for weaving wire fabrics. A communication.
2305. James Miller Brown and Thomas Brown. Improvements in the manufacture of folding chairs.
2321. Henry Bessemer. Improvements in the manufacture of cast steel.
2337. Doctor Graham. Improvements in the manufacture of paper-hangings, and in machinery to be used in such manufacture. A communication.
2347. Henry Giller. An improvement in globes and shades for gas and other lights.
2353. Nathaniel Chattswell Dodge. Improvements in machinery or apparatus for spreading or distributing waterproofing, or similar compositions, over webs or sheets. A communication.
2358. William Teall. A mode of treating certain materials containing fatty or oily substances, in order to extract those fatty or oily substances therefrom.
2405. Edwin Tomlinson and Alfred Mortimer Job. Improvements in waterproofing skins of animals.
2416. Peter Armand Lecomte de Fontainemoreau. Improvements in breaks for railway carriages. A communication.
2432. Alfred Vincent Newton. Improvements in the manufacture of gas. A communication.
2450. John Patterson. Improvements in mills or machines for grinding, crushing, cutting, and hulling or shelling various kinds of farm produce, and also for crushing and grinding minerals and other substances.
2468. Fennell Allman. Certain improvements in apparatus for the production of steam.
2470. George Collier. Improvements in weaving carpets and other pile fabrics.
2482. Peter McGregor. Improvements in water-closets.
2498. Charles Hart. Improvements in threshing and dressing-machines.
2508. Charles Marie Pouillet. Certain improvements in railways.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

738. Richard Coad and John Peers Coad.
748. Constant Jouffroy Duméry.
754. William Fraser Rae.
755. James Robertson.
762. Joseph Burley.
767. John Ramsbottom.
787. Moses Poole.
790. Benjamin Nickels.
795. Henry Bessemer.
797. Henry Bessemer.
799. Henry Bessemer.
803. James Nasmyth.
820. Samuel Hunter.
871. James Taylor.
876. Jean Hyppolite Salvan.
1094. Alfred Krupp.

LIST OF SEALED PATENTS.

Sealed November 9, 1855.

1130. Benjamin Nicholls.
1170. James Park.
1186. Edward Aldridge.
1196. John Aspinall.
1198. Jean Ciancaleone Ricu and Carlo Bartocci.
1218. Joseph Leese, jun.
1231. William Arthur Henry.
1243. Charles Tennant Dunlop.
1248. Robert Ashworth & Samuel Stott.
1263. Henry Cartwright.
1272. William Eley.
1478. Robert Besley.
1563. Edward Simons.
1867. William Emerson Baker.
1976. Alexander Isaac Austen.

Sealed November 13, 1855.

1084. James Pettigrue.
1089. John Mason, Samuel Thornton, and Leonard Kaberry.
1093. Levy Lewis Hill.
1096. Peter Christie.
1097. Robert Jobson and John Jobson.
1101. Wilfrid Latham.
1115. Jean Guillaume Butt and Jean Alfred Martin.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Oct. 24	3773	Fairbanks & Lavender.	Walsall	Stirrup.
25	3774	S. Twist	Birmingham	Billiard table.
	3775	J. Fairman	Bishopsgate street	Perflated coat.
31	3776	W. Tasker and C. Haslem	Newbury and Reading	Wheel roller for clod crushers.
Nov. 6	3777	J. Finlayson	Pendreich	Plough guide.
,,	3778	A. Hibbs & W. Acton	Sheffield	Throttle valve.
7	3779	C. Burton	Oxford-street	Nursery swing.
8	3780	W. Garston	Baker-street	Corbillard or hearse.
9	3781	S. Challinor	Fleet-street	Bottle holder.
10	3782	W. Kennard	Holborn	Parts of a lock.
12	3783	J. Shaw and Co.	Sowood Hill, York	Wire heald.
,,	3784	T. B. Sharp and W. F. Batho	Manchester	Cutting tool.
13	3785	A. Love	Liverpool	Cooking lamp and stand.

PROVISIONAL REGISTRATIONS.

Oct. 25	708	S. Norris	Horseferry-road	Expanding boot.
Nov. 8	709	W. A. Lyttle	Cooteshill Cavan	Lock-protector.
10	710	T. and C. Clark	Wolverhampton	Sash-frame pulley.
14	711	E. Israel	St. Mary Axe	Glove-purse.
15	712	G. S. S. Gower	Ipswich	Shirt-front.
17	713	S. Limebeer	Pentonville	Basket sifter.
,,	714	R. Martin	King's Cross	Gutta percha golosh.

CONTENTS OF THIS NUMBER.

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MESSRS. HUNTERS' IMPROVEMENTS IN STONE-CUTTING MACHINERY

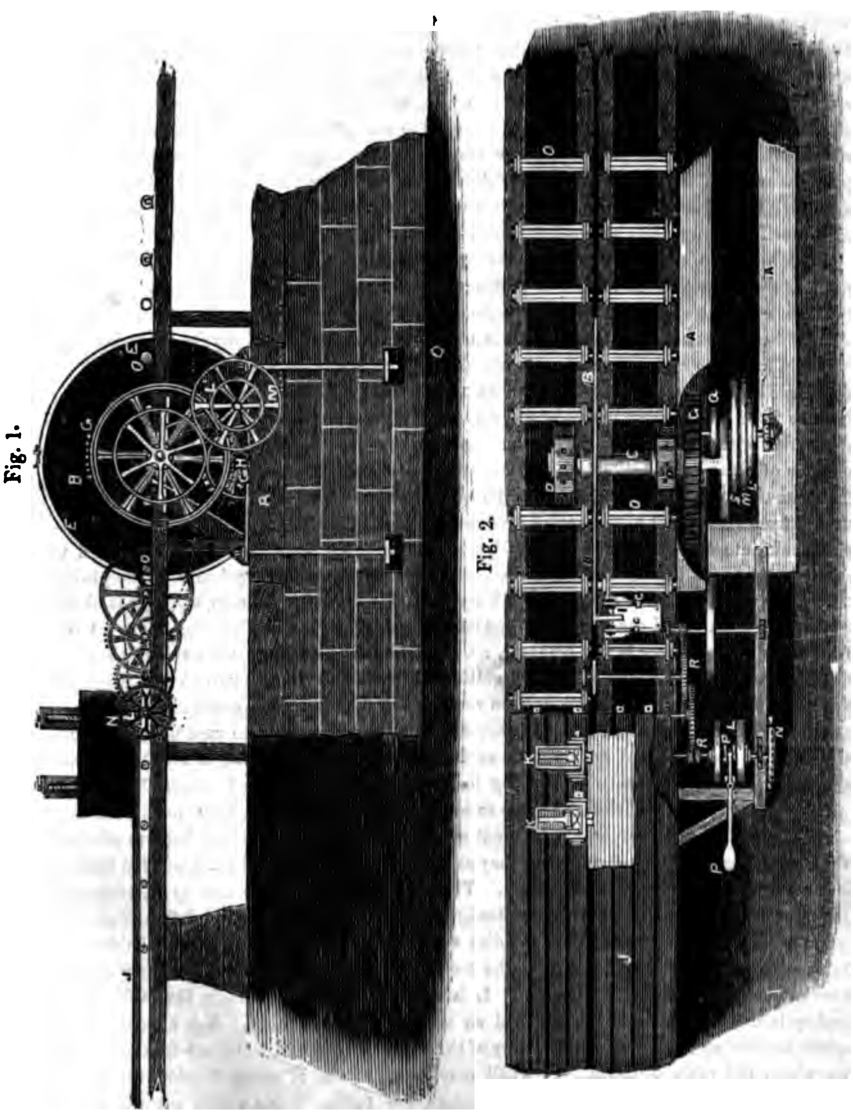


Fig. 1.

Fig. 2

MESSRS. HUNTERS' IMPROVEMENTS IN STONE-CUTTING MACHINERY.

(Patent dated April 24, 1855.)

Messrs. J. and G. Hunter, of Leysmill, Forfar, have patented an arrangement of stone-cutting machinery which comprises certain improved tools, and an improved table for carrying the stone to be cut. The tools consist of a saw, or circular disc of iron, fitted on its periphery with holders for the reception of teeth, in such manner that the teeth, or any of them, may be turned or removed, and fresh teeth substituted for them during the working of the machinery. The teeth are circular (or of such other form as will permit of their being turned round) at their cutting edge, and hollow for some distance up their stem. They fit into holders, and are prevented from falling out by a spring, or other suitable contrivance. When the under edges of large blocks are to be preserved, a similarly constructed and smaller tool is caused to cut an inch or two in advance of the main tool, but below the stone. Rotary motion is communicated to the tools from any prime mover. The table is furnished with brackets for fixing the stone, and with bars for steadying its motion, and connected to it is a hand or foot-wheel for drawing it back. It is also provided with rollers to travel upon.

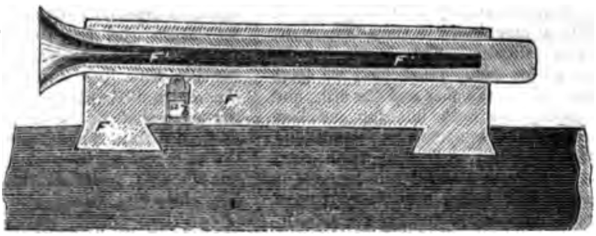
Fig. 1 of the accompanying engravings represents a side elevation, and fig. 2, a plan of the improved machine. Fig. 3 represents a section of the holder and tool; and fig. 4, an end view shown detached from the disc. Figs. 3 and 4 are on an enlarged scale. A A is the basement of the machine. B is a plate or disc of metal, of any required diameter and thickness, which is mounted upon the shaft, C, revolving in the bearings, D D. This disc has shrunk or otherwise fixed upon its periphery a malleable iron ring, E; or this ring may be fitted on the disc in two or more pieces. F is one of a series of holders, which is dovetailed into the ring, E, thus rendering it secure in its place, but at the same time capable of being readily removed. F is a tool of steel, which is made hollow in the stem to facilitate the dressing or sharpening of its edge. This tool is kept in its place and prevented from falling out of the holder by a spring, *a*, of India-rubber or other suitable material, sunk into the recess, *b*, in the holder, as shown in fig. 3. The disc, B, is caused to rotate by means of the toothed wheel, G, keyed upon the shaft, C, geared into by the pinion G′, on the shaft, H. The speed at which the disc, B, rotates for ordinary working is about 30 feet per minute, and the tools are fitted on to the ring at suitable distances apart. I is a friction roller, revolving in the brackets, *c c*. This roller bears against the side of the disc, to prevent the disc yielding when only cutting on one side. In some cases the inventors find it necessary to use friction rollers on each side of the disc. J is a table of cast iron, of any desired length and breadth. This table may be so arranged as to pass under or above the shaft of the disc, and has upon its surface a number of V grooves, in which are fixed the heads of the bolts used for fastening in the brackets, K. These brackets, K, are supplied with screws for securing the stone to be cut, and are of various sizes, to suit different sized work. When the stone has been cut or dressed, these brackets fold back to admit of the slab being readily removed, when they can be again adjusted, and the block fed forward to undergo a fresh operation of cutting. The table, J, is formed in two parts, connected together at the back, if necessary, for steadiness, a sufficient space being left between the parts to allow of the revolution of the disc and tools. The underside of each half of the table is provided with two racks, into the teeth of which suitable pinions gear for feeding forward the table and stone to be cut. L is a pulley for running back the table. This pulley is driven by the pulley, L′, fixed on to the loose pulley, M. N is a hand or foot wheel for moving the table independently of the pulleys, L and L′. O O are friction rollers, on which the table, J, slides. In small machines, instead of using friction rollers, the inventors prefer to employ slides fixed beneath the table. P is a clutch box and handle for throwing the pulley, L, in or out of motion. Q is a pulley for driving the gearing, R R,

in connection with the feeding table, and S is a pulley, driven by a strap from a steam engine or other motive power, for imparting motion to the whole of the machine.

Although the tools and holders have been described as mounted on a disc or plate, the patentees do not confine themselves to that arrangement alone, as they may be fixed to a

Fig. 3.

Fig. 4.



rod caused to reciprocate by any suitable combination of machinery, the method of feeding the block being the same as that before described.

ON THE MACHINERY OF THE PARIS EXHIBITION.

BY W. FAIRBAIRN, ESQ., C.E., F.R.S., ETC..

(Concluded from page 484.)

HYDRAULIC ENGINES AND MACHINES.

The turbine appears to have supplanted the water-wheel almost entirely in the estimation of the French engineers and manufacturers; and the millwrights or constructors, availing themselves of the Universal Exhibition, have contributed a great variety of articles of this kind. In many parts of France, Switzerland, and Germany—particularly in the mountain districts, where fuel is expensive—the turbine is of great value; and in many parts of the country where water and high falls abound, the turbine is a more convenient and less expensive machine than the water-wheel. On the subject of turbines and their comparative economy, there exists, however, considerable difference of opinion: the advocates for the turbine contending that they are equally effective as the water-wheel, and yield from 70 to 80 per cent. of the theoretical fall. Others, again contend for superiority and economy in the water-wheel. In my own experience I have found them range from 50 to 60 per cent. of the actual fall, and in some cases as high as 65 to 70 per cent.; but they are certainly not so effective as the breast-wheel when well constructed, yielding, as a well-constructed wheel will do, from 75 to 80 per cent. In the turbines there is, however, a considerable reduction in the first cost of the machine, and looking at their great velocity when propelled by high falls, and their relative weights, they are certainly preferable, under certain conditions and certain localities, to water-wheels. In other respects where the fall of water does not exceed 50 feet, the water-wheel will be found to possess, as far as my experience goes, considerable advantages over the turbine.

MACHINERY FOR THE MANUFACTURE OF COTTON, SILK, FLAX, AND WOOL.

In these departments, namely, the French, Belgian, and Zollverein, several excellent specimens of machinery are to be found. Some of them highly finished, and the new combing machine made by the Messrs. Schlumberger and Co., appears conspicuous for its ingenuity, and the efficiency of its operations. This machine has been greatly improved by Messrs. Hetherington and others, since its first introduction into Manchester and Bradford, and in the preparation of cotton for fine yarns it is one of the most important machines that has come into use for many years. In the combing of flax and wool it is becoming equally important, and in its application to the manufacture of the long wool, alpaca, and the mohair fabrics of Bradford it has at once established its superiority over the system of carding and combing by the old process. The English contributions of machinery are always safe in the hands of such men as Platt Brothers, and Co., and the other English contributors. Several newly-improved machines of the very best construction may be seen in the space occupied by the English for the manufacture of cotton. Messrs. Platt Brothers, and Co., have contributed a complete system of cotton machinery; and Messrs. Elce and Co., of Manchester, have done the same, excepting only the blowing

and spreading processes which have been omitted; Mr. Mason, of Rochdale, has also contributed several specimens of exceedingly well made machines. The machinery for the manufacture of flax and silk is very imperfectly represented in the English department, and excepting only the samples of yarn, there is nothing to distinguish the superiority of machinery in those important branches of industry. This is much to be regretted, as for many years past we have taken the lead in the flax and the silk, and the machinery for both has for the last fifteen years been exported to France and every other kingdom in Europe to a great extent. Mr. Peter Fairbairn, of Leeds, a large constructor of flax machinery, stands prominently forward in having effected the greatest improvements in his contributions to the perfection of those machines—in fact, his machinery is to the flax manufacturer what Mr. Whitworth's machine tools are to workshops, of the very first quality; and the reason assigned by him for not exhibiting is the enormous expense of showing his very extended series of machines to advantage. These circumstances are the more to be regretted as the deficiency of the English department is sufficiently apparent to account for the absence of this important branch of our national industry.

FLOUR MILLS.

Thirty years ago, the flour mills of France and most other parts of the continent, were of rude construction, and exhibited few traces of improvement from the constructions of the previous century. The corn mills in England, Scotland, and Ireland had also been nearly stationary for the same period of time, with the exception, probably, of some changes and improvements effected by Smeaton and the late Mr. Rennie. At the close of the last or about the commencement of the present century, the Americans, as well as ourselves, introduced the system of creepers and elevators, by which a considerable amount of labour was saved, and the operations of grinding rendered more complete; and from time immemorial it has been the custom to drive the millstones from a large spur-wheel, round which they were placed, in the middle of the mill. This arrangement of the grinding process is still in use in many parts of France, and several exhibitions have given examples of some of their best mills on this principle. Like those of this country, they are nearly all of them continuous in the process of cleaning the grain, grinding, and dressing the flour. The millstones are generally driven by straps or belts, whilst those in England are almost *entirely driven* by gearing.

The contributions to the Corn Mill Department are numerous and interesting; and the contributors have shown no small degree of skill in the numerous forms and devices by which they respectively recommend their machinery to public attention. A flour mill, by Burdon, of five pairs of stones, and driven by a turbine, on the principle of Poncelet, deserves especial notice, from the novelty of its design and the facility by which the stones can be stopped and started. The turbine, with its cistern, is placed below, in the centre of the stones, five in number, and the main shaft or spindle penetrates the first floor, and from thence ascends to the top of the mill, and in its passage gives motion to the different machines for dressing, cleansing, elevating, &c.

SPECIAL MACHINERY AND APPARATUS FOR WORKSHOPS.

The articles contained in this classification comprise a collection of such varied forms and character as to render any process of adjudication extremely difficult, and the distances by which they are separated from each other, renders it still more troublesome to arrive at a just and correct decision. * * * Amongst other novelties of the Exhibition is the engine of Mr. Siemens. It is upon the regenerative principle, or that of rendering active the latent heat of steam by a process of applying heat to the steam of the cylinder as it is exhausted at the end of the stroke. This steam having performed its work upon the piston, is discharged through conducting pipes into a second and third cylinder, and these two latter are enveloped by exterior cylinders, having furnaces at the ends, and on which the heat currents of these furnaces impinge, giving to the lower end a temperature in the interior of almost 500°. This increase of temperature surcharges the steam as it passes from the centre cylinder, doubles its volume, and acting upon the piston or plunger by its expansion, drives it forward ready for the same repetition in the succeeding stroke. The steam, thus expanded and reduced in temperature, is passed by another conducting pipe into the opposite side of the piston, which, acting upon it in a state of saturation, having received some additional heat in its passage through some wire gauze which fills the annular space between the two cylinders over the furnaces, it is again ready for the succeeding stroke. In this way the engine is worked, the steam making a constant circuit, and worked over and over again with about 1-10th of supply from a small vessel or boiler, attached immediately above the heated cylinders. The results, according to Mr. Siemens, are highly satisfactory, and produce from the same quantity of coal more than double the force of the steam engine.

ARE LIEBIG'S LAST VIEWS ON FERMENTATION AND PUTREFACTION TRUE?

BEING A SECOND MEMOIR ON THIS SUBJECT.

BY HORATIO PRATER, ESQ., M.D., &c., &c.

IT is well known that during *most cases** of putrefaction and fermentation microscopic organized forms make their appearance. Now, according to the more ancient theory, which dates from the time of Aristotle, and is called "equivocal generation," these forms are *actually produced* by the chemical affinities taking place in such solution of organic matters at such period, viz., when decomposition begins. According to the more recent theory, of which Spallanzani was the originator or most powerful advocate till the time of Ehrenberg, the air always contains numerous invisible dried seed and ova, which are taken up by it in the processes of evaporation and otherwise. In the case of fermentation, then, these seeds falling in the fermenting liquid, there find a suitable *nidus* for their development; and hence are produced the appearance of minute vegetable structures, recently described more particularly by the French naturalists as existing in fermenting liquors; or in a more visible form in the various species of mould. In like manner, when dried ova fall in putrefying solutions, and there find a suitable *nidus*, *infusoria* are produced.

Whichever of these theories we adopt. *organic germs* have usually been considered as more or less causes of, or as at least necessarily concerned in, fermentation and putrefaction. Liebig, however, thinks that such organic germs are only *accidental accompaniments* of the processes; and the two principal reasons he gives for such opinion are, first, as already mentioned, that it is only in *some* cases of the putrefaction of urine that such organized forms appear; and, 2dly, though in that peculiar decomposition of sugar in which yeast, alcohol, and carbonic acid gas are produced, such forms appear, still they appear "in no other mode of the decomposition of sugar, such as its conversion into lactic acid by the action of animal membrane, or its resolution into mannite, gum, butyric, or acetic acid."* (Op. Cit., p. 218.)

I think, from these circumstances, we must agree with Liebig, that such organized forms are, at least in such cases, not the cause of putrefaction or fermentation; but this admission, it will be observed, *does not at all tend to clear up the mystery of the* CAUSE *of the appearance of such organized forms.* We may agree or not with Liebig in his hypothesis of the cause of fermentation and putrefaction; viz., that it is a "state of chemical action communicated by contact," and dependent on the law which he has attempted to trace as existing in inorganic matter; viz., "that the particles of matter in motion tend to communicate the same state of motion to surrounding atoms," and yet leave the cause of the appearance of organic forms in putrefaction or fermentation totally unexplained. We may, in fact, agree with Liebig, and yet know not whether to decide with Aristotle or Spallanzani.

Although it be very doubtful whether the influence of *mechanical motion* in exciting crystallization in a saturated saline solution, or in making black sulphuret mercury red *crystalline* cinnabar, or in making iron *crystalline* by influencing cohesion; or of *contact* as making the fulminates of silver and mercury to explode, or platinum and silver *in alloy* dissolve in nitric acid, or *alloy* of zinc, nickel, and copper dissolve in dilute sulphuric acid, though copper alone will not, (Animal Chemistry, third edition, pp. 109—193), is rightly put by Liebig as evidence of the same power existing in inorganic matter, even in a minor degree, that exists in organic matter and causes putrefaction and fermentation; still it is clear, as he says, that "*the action of ferments varies with their condition*;" "thus, *fresh* infusion of malt changes starch into sugar; but after eight days loses this property, but *now* causes sugar to ferment." So in regard to cazeine and sugar, and animal membrane and sugar, (p. 199.) *I infer from this* that a *particular kind of motion can only communicate a particular kind of motion, and not another kind:* that motion only communicates *motion like itself.* This is exactly synonymous with *generation producing only its like.* Just so, fermentation produces only fermentation, and putrefaction only putrefaction.

Dr. Ayres (*Lancet*, April, 1848,) shows that a thread dipped in *putrid* matter, and left in some fresh mutton and water, caused complete putrefaction in 24 hours; though

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* I purposely say *most* cases; for Liebig affirms that in numberless cases, where urine putrefies, it is impossible to discover in it any organized being whatever (Animal Chemistry, last edition, p. 219). It must, however, be observed in reference to urine, that it is doubtful whether it ought to be noticed in an essay which is intended to concern only the putrefaction of *animal organised substances*; for by this expression urine is obviously excluded, it being in reality a mixture of inorganic salts and excrementitious animal matter. Hence it is not in reality an exception; *organized* animal and vegetable substances being understood to be meant when speaking on this subject. (Subsequent Note.)

* This, however, is too sweeping an assertion; for in the formation of acetic acid, as Berzelius says, they (at least, microscopic eels,) are there present, and so large, as to be visible *sometimes* to the naked eye. (*Traité de Chimie.*)

no evidence, in either portion left for comparison, of putrefaction before 36 hours. Thus, then, an *animal* putrescent *fluid* produces its like; and Ayres thinks this is the case in *contagion*, where an ANIMAL fluid *evaporates* and generates its like in *living* bodies; for he says, neither sulphuretted nor carbonated hydrogen ALONE produce fever. Again: oxygen is as necessary for putrefaction as for life. In nitric oxyde gas, ammoniacal and carbonic acid gas, meat, in Ayre's experiments, did not putrify; *but these gases kill living bodies, or are irrespirable.* In like manner French naturalists have lately found that bichloride of mercury, and many other agents fatal to life, stop fermentation. The question, then, is whether a *low degree of life* does not *remain* in putrefaction? also in fermentation? or whether there is an actual *impartation* of life, or whether Liebig's theory is right? If any example exists of particles in motion (not being of decomposing matter or ferments), exciting *putrefaction or fermentation*, I am ready to adopt Liebig's opinion of fermentation and putrefaction being similar to those actions in inorganic matter which he has collected together, and which I have above copied from his work. But the fact is, fermentation and putrefaction are peculiar to *organic solutions;* and at present we know of nothing but what at least *has had life*, or been produced by living matter, that can cause them, or indeed I may say, any actions like them; for most of those mentioned by Liebig bear little or no resemblance at all to them: and the solution of an alloy of platinum and silver in *nitric* acid has been shown in the *Lancet* (1846), not in reality to resemble them. Still more decidedly is this the case with the alloy of copper dissolving in dilute sulphuric acid; for Liebig himself admits that the copper must be in a very particular proportion to be dissolved in this case.

Again, Liebig has overlooked the curious fact that the *very same* agents that cause life to cease, also cause fermentation and putrefaction to cease, as I have above observed is to be deduced from the experiments of a French philosopher, and also from Dr. Ayres "on Putrefaction." It is a fact, then, that what are called *poisons* stop putrefaction and fermentation; but to make his analogy hold, Liebig should have shown that these agents also stop the sudden crystalization of salts, explosion of the fulminates, solution of platinum in nitric acid, &c., &c.; *but this he has not done.*

To this, indeed, it may be urged that poisons would necessarily kill the *infusoria*, or vegetable fungi, since Liebig does not *deny these* to be alive and to exist in some *cases of* putrefaction and fermentation; but *they stop* these actions likewise, even this view brings us to an opposite opinion to that of Liebig's, for it forces us to admit that the life of such *monads* is, more or less, *the cause of putrefaction and fermentation, at least in such cases.* I say, at least in such cases, and must beg the reader to remember that such cases constitute the *great majority*, as admitted by all microscopical observers; and as I have already stated that Liebig has incorrectly put down acetic acid as among the instances of fermentation where no living monads appear, it seems probable that even the other cases mentioned by him, and quoted at the beginning of this essay, deserve more careful scrutiny by the microscope.

On the whole, we may safely conclude that much is still wanting before Liebig can be said to have referred putrefaction and fermentation to a property common to purely inorganic matter. Let us now turn to the question as to whether Aristotle or Spallanzani's opinion as to the origin of *infusoria* is the more probable.

Although Liebig says little on this point directly, yet, from various passages in his work, it is clear that he adopts Spallanzani's view, that they arise from ova floating about in the air. But it is remarkably singular on this point that he himself furnishes, unconsciously, by a quotation from De Saussure, one of the strongest *analogical* arguments against the very view he adopts. It has now been asserted some years, by various microscopical observers, that if air* has been previously made to pass over red-hot iron, or through a solution of concentrated sulphuric acid or caustic potass, in such cases no organic monads are produced when fermenting or putrefying solutions are placed in contact with it. Now, as under such circumstances no *ova* could exist in the air, these experiments seemed fatal to the Aristotelian view; for it might be said, here is the *same* animal or vegetable infusion or solution; why, then, if infusoria are *formed* from this, do they not now appear, particularly since the air seems the same; except that all *ova* in it must have been destroyed by the processes which it has gone through? I have said "seems the same," for we now come to Liebig's quotation from De Saussure, just alluded to, which will tend to make us believe that in reality air which has been subjected to the above processes *is altered in its ordinary*

* The reader will remember that air is absolutely necessary to all fermentation. Thus Gay-Lussac found that if fresh grape juice which ferments spontaneously in contact with air, is put up a glass jar full of mercury (hence without contact of air) that no ferment is formed.—*Graham's* "Elements." Art. Fermentation.

chemical affinities,* as well as in regard to any ova that may have existed in it, being destroyed.

According to De Saussure, "Hydrogen produced by the action of iron on water, at a *red heat*, when in contact with putrifying and decaying animal matters, did not combine with oxygen, while pure hydrogen, obtained at the ordinary temperature, is readily converted into water under these circumstances." †

Now, what I have to observe on this experiment is, that if the affinity of hydrogen is altered by having been placed in contact with red-hot iron, why may not that of air be so likewise? consequently, *if it is*, the Aristotelian view of the origin of *infusoria* may still be true.

Returning to the properties of air, which has been subjected to strong solution of potass hereafter, I shall here consider at length the *strongest* of Liebig's arguments against "the parasitic theory," as he terms it, of fermentation and putrefaction.

He says (at pp. 216, 17):—"In the fermentation of grape-juice and of infusion of malt, the weight of the yeast or ferment increases; but if yeast be added to a pure solution of sugar, fermentation, indeed, equally takes place; but in this case the weight of the yeast, instead of increasing, diminishes. By repeatedly placing the same portion of yeast in contact with fresh portions of solution of sugar, it entirely loses at last its power of exciting fermentation, while its weight continually diminishes." In reference to this difference Liebig observes, in continuation, "If we assume that the nutritive and respiratory process of the fungus depends on a sulphurized and nitrogenized substance containing the elements of the fungus, and that the fermentation of the sugar is an accidental phenomenon accompanying the development of an organized being, it is still utterly incomprehensible how it happens that the fungus should not reproduce itself in a fluid where the chief condition to its propagation is present, while it immediately increases as soon as the accidental accompaniment of its vital process, viz., the sugar, is added. When, for example, in grape-juice all the sugar has been decomposed, and the air is excluded, the residue of the sulphurized and nitrogenized matter dissolved in the juice keeps for years without any change whatever; but if sugar be added to the liquid, fermentation again commences, and yeast is again separated. When the added sugar is decomposed, this separation of yeast ceases; but it begins again when a new portion of sugar is added, and this continues *until the liquid contains an excess of sugar undecomposed*." (P. 218.)

Now I have purposely marked the last words by Italics because if this be considered, it will appear that the fermentation of grape (and malt) is not so different from that of a mixture of yeast and sugar as Liebig has endeavoured to make out in the foregoing extracts. At all events, in both cases we may observe that, *like all organic actions*, the power in existence *is a temporary power*. In the latter case it, in Liebig's words, ends when there is "an excess of sugar undecomposed." In the case of yeast and sugar again, the yeast loses also "at last its power of exciting fermentation," that is, it can only act upon the sugar *a certain time* and cause fermentation. To be sure, Liebig adds that, in this case, "*the weight of the yeast continually diminishes*." And if this remarkable assertion be a fact (well worthy further examination), I must so far yield to him that fermentation *can* take place without, as far as we can perceive, any generation or production of organized globules.*

Another point in reference to the general principles of fermentation mentioned by Liebig at p. 221 of his work must not be

* By the recent experiments of Professor Draper, of New York, and others, we now know that exposure to *light* effects a material alteration in the affinity of chlorine for hydrogen.

† *Liebig, p. 220. (Note.)*

* It must, however, be considered very extraordinary that fermentation (that is, the resolution of sugar into alcohol and carbonic acid) has only hitherto been effected by the presence of *organic globules* (yeast). Life would appear necessary to produce this chemical action on sugar, and such action is *generally* attended by a reproduction of the life in other organic globules, but, according to Liebig, *not always*. Supposing Liebig right in this case, and that the globules in such cases are, so to speak, *sterile*, I may reasonably admit that I cannot give a satisfactory explanation why sterility should occur in this case any more than in many others in animated nature, where we see it obtain. But, on the other hand, I think that Liebig, since he calls fermentation a mere chemical action, should try and inform us why it has never yet been produced without *the presence of living globules to commence the action?* and why it only takes place at a *certain temperature, which is similar to that of the life* of warm-blooded animals?

Again; with regard to the non-reproduction of the globules when only a solution of sugar is present, it must be observed that for generation and nutrition certain conditions are always requisite, and one essential one is that matter having *a certain composition* (*i. e.* organic matter) should be at hand for decomposition or re-arrangement. Now, solution of sugar (as being a compound which crystalises) is not so clearly an *organic* compound as infusion of malt is. In solution of sugar, then, the globules can live, and perhaps get a *certain amount* of nourishment, just as Majendie's experiments show that animals can out of the same; but as these same experiments show that sugar *per se* is one of the worst nutritive matters, so, in like manner, it would appear to be for these globules, which to reproduce themselves require a more highly elaborated organic matter, viz., that coming from barley (infusion of malt).

forgotten. "The brewer of beer must *add* yeast in order to cause his worts to ferment;" but grape-juice ferments *by itself*. Although the whole tenor of Liebig's views leads to the conclusion that he considers the germs of animalcules to exist in the air, yet in this place he asks, "how are they not developed in this soil (worts, or infusion of malt), although in it all the conditions of their life and propagation are present?" He replies, "The fermentation of grape-juice begins with a chemical action: an appreciable volume of oxygen is absorbed from the air; the juice then becomes coloured and turbid, and the fermentation commences only with the appearance of the precipitate." He concludes by saying, that "when the substance *which absorbs the oxygen has become insoluble, fermentation no longer occurs in the same juice.*"

One would certainly be inclined from this passage only, to conceive that Liebig adopted the Aristotelian view of chemical action of the oxygen absorbed by the fluid actually *forming* the animalcules; but no, his object in the above quotations is merely to bring another argument in favour of his tenet that fermentation is a mere common *chemical action* like the others he has detailed occurring in inorganic matter.

(*To be continued.*)

PERMANENT WAYS.

THE PATENT OF PERCEVAL MOSES PARSONS —THE PERMANENT WAY COMPANY.

Some time since we reviewed a circular issued by the Permanent Way Company, whose business it is to buy up and work permanent way patents. Amongst others, they have had a long monopoly of the Fish-joint patent of Mr. W. Bridges Adams, and report says that they have found it very profitable. This appears to have produced its effects upon Mr. Perceval Moses Parsons, who has been advertising in *Herapath's Journal* that he, and not the Permanent Way Company, is the true and lawful owner of fish-joints, calling on the lieges to aid and abet him, for a consideration, in finding out all infringers of his patent of February, 1849, proposing also exceedingly moderate terms of licence to "directors, engineers, manufacturers, and others."

After examining Mr. Parsons' patent, we see no reason whatever why the Permanent Way Company should trouble themselves about his pretensions. He appears to have three leading ideas. First. To fit the double nge *or double*-headed rails in grooves of ss *sleepers cut* transversely, and to make n *fast by* wooden keys, "without the aid hairs *or* trenails." How the groove is to be made to fit the rails, he does not specify. But assuming this to be done, it is a wooden arrangement, better fitted for a wooded country than for a country into which wood is imported. The sleepers must be made of so much extra depth as would involve a new class of timber, and multiply their cost by three. Apart from cost, the plan would not be objectionable; but in this bedding of the rails in timber, Mr. P. M. P. is not, it appears, original. It had been done before the date of his patent, though Mr. Parsons has a great faculty of substituting long grain for short, and *vice versâ*, making distinctions without differences.

The second idea of Mr. P. M. P. is to alter all the practices which have obtained in fastening contractors' and bridge-rails to sleepers. Whereas they have been spiked or bolted through or at the edges to hold them down to the sleepers, Mr. P. propounds gravely the very great improvement, in his estimation, of using wooden trenails instead of spikes, driving them through large holes in the rail flanges. To prevent the thin flanges from cutting the trenails, they are to have ferrules of iron at the top.

Thirdly, Mr. Parsons claims the use of "clamps or splints" in the channels of the rails, in some cases confined by the wedges, in others by a bolt through the joint. These clamps or splints are the fishes described in Adams's patent, put into the wood sleepers instead of into iron chairs; and as regards the bolt, bolts were used as a substitute for fixing the fishes in chairs before the date of Mr. P. M. Parsons' patent, and the result proves that the practice has been a deterioration in that particular mode. The original use of the fishes was in the repairs of rails, the ends of which had been damaged top and bottom by hammering between the wheels and chairs, and which, therefore, could not be firmly fixed in chairs; and therefore, in the specified plan, the chairs were removed three inches from the joint each way, the rails being thus suspended by the fishes at the joint.

Removing the chairs to the end of the fishes, a distance of twenty inches, and supplying the place with transverse bolts, was a mischievous innovation, made for the sake of cheapness. The length of bridge between the chairs causes the rails to vibrate and the bolts to shake loose; and unless the bolts be tight and firm, this kind of fishing is the worst of all joints, for the form of the rail channels makes the section of the fish a very obtuse wedge, which depends wholly on the bolts for tightness. Since the fish patent was first specified, two patents have been taken with a view to keep the bolts tight—one to roll a groove for the square heads of the bolts to lie in; the other to make one of the fishes serve as a bunch of

nuts for the bolts by accurately-drilled and screwed holes. The last plan—not patented, is to apply longer bolts, and put on double or lock nuts.

But if the resistance of the fishes be examined mechanically while under the rolling loads, it will be seen that the rails form acuter wedges than the fishes; consequently the weight tends to strain the bolts, and force the fishes apart. Moreover, the thickness of the fish-plates is practically limited by the size of the hole, seven-eighths of an inch in diameter. Thus the plate is about three-fourths of an inch thick by two and a half inches wide, and one foot six inches long. Four holes of this diameter very much limit its vertical strength; and it is quite a common thing to see them set into a wave line or permanent sinking. There is, besides this, another difficulty caused by the process of rolling. In Wales a thousand tons of rails are supposed to wear out the rolls, and the last rails are heavier than the first, so that it is a custom to allow an increased per centage of weight. In the north this per centage is allowed to be of greater extent. The process is this:—The channels in rolls are always widening, and in rails narrowing. Thus the corresponding channels in the rails grow less, and the fishes grow larger, both departing in opposite directions from the normal standard. Therefore the greater part of the rolled fishes do not fit the rails, and rapidly get loose.

If Mr. Perceval Moses Parsons has created a sensation in the breasts of the Permanent Way Company, we recommend them to go to the Enrolment-office, and examine his black letter and twenty-five diagrams, before they treat for the purchase of his patent out of their unlimited funds. We regret that Mr. Woodcroft has not yet printed it for circulation amongst other railway tracts. We should work much more in these diggings were they more accessible. We really think that when he has done the smoke patents, he might begin on the railways. Meanwhile there are several prominent railway patents which we may analyze shortly.

The "Notice" of Mr. Parsons would have served Cobbett for mirth. "It having come to my knowledge, &c." Why could not he or his agent say at once, "*Knowing* that clamps, splicing plates, *alias* fishing plates, &c.," if he does know? But it is quite clear that he does not know too much of engineering, or he would not be ignorant that splicing and fishing are two utterly distinct operations, while he makes them convertible terms. Sailors splice ropes continually, and fish spars, and occasionally scarf a timber; but we never heard of their splicing a spar: it would be thought a very lubberly expression.

ON SCIENTIFIC LECTURES.

[The following remarks are extracted from the address of the Rev. James Booth, LL.D., F.R.S., as Chairman of Council, to the members of the Society of Arts, at the first ordinary meeting of its one hundred and second session, on Wednesday evening, November 21.]

Whatever value may attach to lectures on moral or religious subjects, on those which set the imagination to work, or kindle the emotions, I am convinced, from long thinking over the subject, that scientific lectures, as they are called, or talk about physical phenomena, or abstract researches in pure science, are of very little educational value. They are useful because they amuse; they are pernicious because they beguile those who habitually listen to them into a loose sort of notion that they know something of science. This may seem a very sweeping and a very needlessly wide generalization on my part, but it is high time to put an end to this delusion in education. Men cannot scale the arduous and rugged paths of science by sitting still, and using only their ears. It was long ago said, "There is no royal road to learning;" it is just as true that we cannot get there by railroad; every man must travel that journey for himself, on foot, happy if even foot-sore and weary he shall at length reach that "city placed upon a hill," "whose light cannot be hid." The grounds on which I have been led to hold this very unfashionable opinion are very convincing to myself. When we want to move the affections, to raise the passions, to influence the will, or to urge forward the action—in short, when we are required to operate on the emotions, then an oral discourse, whether it be called a speech or address, a lecture or a sermon, is unquestionably the true instrument to use. Now the signal efficacy of this mode of access to the mind being unquestionably, in its legitimate sphere, the excitation of the emotions, it was a very natural, though unsound generalization, that the same method, oral teaching or lecturing, would develope the powers of the pure intellect. For, as I have elsewhere said, when we are required to bring into active exercise the reasoning powers of the understanding—whose characteristic mode of action was aptly designated by Newton, as patient thinking—which operate slowly, which must pause from time to time, look back, so to speak, and review—nay, sometimes travel over again and again—the steps of recent progress, where a series of unsuccessful tentatives are often of more real use to the mind than the admission into it of a suggested discovery, where the healthful exercise of the toilsome ascent, and not the

prospect it commands is sought for, silent patient study is the only road by which we can in reality advance, and self-instruction is our best equipment for that road. The success of these, as means to an end, can be tested by examination alone. Action is equal to reaction in the material world around us; it would be against all analogy to expect that in the world of thought great intellectual force could be developed without an equivalent mental labour.

THE NEW IRON MORTAR BOATS.

The iron mortar vessel, launched from the building-yard of Mr. John Laird, at the south end of the Docks, the other day, is so constructed, that when she has mortar, shell, crew, and every necessary appliance on board, she will only draw three feet of water. She will present very little bulk above the surface, and as she will be painted sea-green, it will be impossible for the enemy to distinguish her from their batteries, even when within range of their guns, except by the occasional puffs of smoke from each shell. She is of 100 tons measurement, and is made of the best iron plates, manufactured at the Mersey forge. The expedition with which she was constructed is, we believe, unprecedented. The order was received by Mr. Laird, on the 23rd of October; the keel was laid down on the 25th of the same month, and on the 13th of November, just three weeks from the day of the order being received, she was launched in the River Mersey, all complete, with mortar-bed, masts, rigging, anchors, cables, sails, shell-room, accommodation for crew, &c. She left Liverpool for Portsmouth, in tow of the steam-tug Uncle Sam, on the day after she was launched, and arrived at Portsmouth on Thursday, having been delayed by being obliged to put into three ports, owing to the severity of the easterly wind. The vessel is strongly built of iron, with wooden decks, and the complicated nature of the work would have precluded the possibility of her completion in this short time, had not Mr. Laird had relays of men working night and day. The iron plates, &c., were ordered from the Mersey forge from time to time as required; and were generally delivered within twelve hours from the time of the specifications being sent in. The construction of this mortar-boat shows the rapidity with which work can be completed in the Mersey, when all the facilities are properly applied.

This is the first English mortar-boat built of iron, and if the experiments immediately to be tried upon her, answer the anticipations of the Admiralty officials, we may expect to hear of a large order being given for the construction of more upon the same principle.

Mr. Laird is also constructing fourteen wooden steam screw gun-boats, of 240 tons each, and about sixty-horse power. They will be similar in size and armament to the Lynx, Arrow, Viper, Snake, Beagle, and other boats, which have become famous in the history of the naval operations of this war. Mr. Laird is building seven of these boats at his yard on the margin of the great float at Birkenhead; and seven on the Liverpool side. Although the order for them was only received from the Admiralty six weeks ago, already about 1,000 feet of building sheds have been erected at these yards, and fitted with gas, so that the men can work at the vessels night and day. Four of the boats are well advanced in frame, and the whole are to be ready for sea by March next.

STEAM ON THE PRESTON AND KENDAL CANAL.

We are glad to learn that the attempt made by Mr. Rawcliffe (the spirited agent to the Earl of Balcarres, in this town) to introduce steam on the canal between Preston and Kendal has answered the expectation formed of it. A screw boat is now at work; the engine, about 20-horse power, having two 8-inch cylinders, and occupying but little space on board, is placed in one boat, and four others are attached behind, forming what might be called a boat train. The quantity of coal conveyed each trip is about 200 tons, loaded in the five boats, and a speed of two miles per hour is maintained. This speed might be increased, we believe, did the depth of water in the canal permit it; but at present, if a greater speed is attempted, a swell of water is created in front of the boat, reducing the level of the canal at the bows so much as to cause the boat to scrape the bottom. By the old system, one horse dragged a boat of from 40 to 45 tons burden, at a rate of one mile and a quarter per hour. During the last fortnight an extra new iron boat, capable of carrying 57 tons, has been attached to those previously towed by steam (making the five now used), and with this very large additional weight it has only made a difference in speed of three-quarters of an hour per day, and the addition of this extra weight has consequently retarded the boats almost imperceptibly. A new iron boat has just been built for the same purpose, to be worked by steam power. She is a twin paddle-boat. Two boats, each 60 feet long, have one central paddle working between them, and this arrangement prevents the usual swell which the ordinary river paddle

boats create. This steamer has already been tried on the canal, and is found to require less power to do the same work than the screw boat alluded to above. These experiments, combined with the substitution of iron for wood in the construction of the boats, open quite a new feature in the history of canal navigation.—*Preston Pilot.*

NEW REFLECTOR FOR LIGHTS.

A new reflector for lights was exhibited at the Institution of Civil Engineers, at the meeting on the 20th November. It was composed of silvered porcelain, and appeared to possess a very brilliant polish, which was stated to be indestructible. Hitherto reflectors of small sizes only had been produced, but by means now adopted it was expected that they could be made as large as 21 inches in diameter over the mouth. If this manufacture was brought to the perfection that was anticipated, a great economy would result, as the silvered copper reflectors, at present used, were very expensive originally, were liable to oxydation, and were frequently injured by the care of the attendants, in rubbing them to keep the reflecting surfaces bright. The new porcelain reflector had been transmitted by the Honourable Major Fitzmaurice to Captain Washington, R.N., by whom it was introduced to the notice of the meeting.

EXPANDING PORTABLE BRIDGE.

After the meeting at the Institution of Civil Engineers, on November 20th, Mr. Lavanchy exhibited, in the library, a model of an expanding portable bridge of his invention. The system had been tried at Paris, where a bridge on this principle, fixed upon a boat in the canal, had been used for permitting the passage of troops; the boat yielded considerably to the weight of the men brought upon it, but the bridge remained stiff, and the commanding officer had reported well of its properties.

The principle was that of a number of strips of iron or wood, pinned together transversely at such points as that they should form a series of equilateral parallelograms, the extension being obtained by the motion upon the connecting pins, somewhat on the "lazy-tongs" principle. A bridge of this construction could be made very light for any moderate span, and be conveyed by a boat to be projected to both banks of a stream; be used for the centre, or any portion of a long floating bridge of boats; be carried upon a pair of wheels with a regiment, or used for numerous civil purposes; and its construction was stated to be not at all expensive.

A Plan for the Effectual Improvement of the River Thames. By Henry Robinson, C.E., A.I.C.E., M.I.M.E. London: W. S. Johnson, 60, St. Martin's-lane, Charing-cross. 1855.

We shall best promote the object of the author of this pamphlet by laying the substance of it before our readers, merely prefacing our extracts by remarking that as the magnitude of the evil to be remedied is very great, we must not consent to condemn any system of improvement simply because it at first sight appears to be too great an innovation.

"Dirty, and loaded with putrefying matter as the water of the Thames no doubt is," says Mr. Robinson, "it is not from this that the malaria principally springs; there is no doubt on this subject among those exposed to its influence—their evidence is unanimous; it is at low water, and from the mud banks, then for hours exposed, that the pestiferous vapours arise.

"It must not be forgotten that mud and sewage matter have been for centuries accumulating in the river; it is not only recent additions which we see contaminating its waters, but much that has long been there, and might still have been unsuspected, had not the constant action of the small steamboats, particularly at low water, stirred it up and brought it to the surface.

"Estimating roughly the quantity of solid matter in the Thames water at 5 per cent. at half the average depth, there is probably not less than 400,000 tons of solid matter floating, at high water, between London and Vauxhall Bridges. What must, then, be the whole quantity passing the town at every tide?

"Let us not deceive ourselves. If, carrying out the plans now under discussion, every jot of solid matter shall, five or six years hence, be intercepted from the river, years must elapse before any sensible difference will be made in the quality of the water; and at the best, the retiring tide will still uncover the reeking banks, and the general disappointment will raise a public cry against those who, with a well-defined end in view, and with unlimited means at their disposal, could only adopt a plan from which, if steadily persevered in so long (itself a very doubtful question), their children's children might perhaps derive a benefit.

"What is the source of all the evil? Most unquestionably it is the tidal character of the river; and it is against this character that our efforts, to be effectual, must be directed. No insurmountable engineering difficulties oppose our making a change in

this respect; the expense will be far less than that now contemplated, and the sanitary effect will be instantaneous.

"It is proposed to gain this object by constructing a chain of locks across the river at or near London Bridge, provided with sluice-gates, to allow the whole natural current of the river to pass above and below them, or either. The height of the river above bridge may then be kept at the most advantageous level, and the flow regulated at will."

* * * *

"It is not denied that, at first sight, the project is a startling one; but no objection is valid grounded solely on the magnitude of the scheme: no little measure can be efficacious.

"The first great objection which will rise to the lips of all is the impediment to the traffic. To obviate this difficulty, it is proposed to make the dam consist of a series of locks, though observation has shown that half the number would be more than sufficient for the present traffic; and on this head it may be remarked:

"That it is intended to place the dam at or near London Bridge, where the traffic naturally divides;

"Only a small portion of the craft navigating below bridge ever come above, and *vice versa*.

"Various causes have greatly diminished the goods traffic on the river, and further railway development will still more interfere with it.

"At present the tide does practically impede the barge traffic, and allows but eight to fourteen hours in the twenty-four for advancing in either direction; this time is yet further reduced by the difficulty of navigating at low water among the numerous shoals.

"Twice in the day, when the levels on both sides of the dam coincide, a free passage will be open; the average difference will not be great, and by the full use of mechanical appliances such speed may be gained in opening or shutting the gates, that the detention at the locks will be insignificant, and it may further be fairly urged that as all the goods must at last be lifted to the higher level to be placed on the wharves, this will be infinitely quicker done in the lock, and that there is no comparison between the minute required for lifting the whole together there, and the time lost in raising each load by the cranes."

* * * *

"To the sailing barges the change will be special boon; and when it is remembered at the advantage will extend as high as the influence of the tide is felt, and that [illegible]king will be possible at all times from London to Teddington, it cannot well be overrated.

"The speed of the current will, of course, be much reduced. There will be no difficulty in propelling ordinary barges to any of the wharves within a considerable distance from the dam by the common means in use in many places—namely, a long pole reaching the bed of the river, and pushed against by the bargeman, who walks along the edge of his vessel as it advances.

"For those dumb barges bound to a greater distance, it is believed that a class of small tugs would be created, and pay, as a speculation, at a rate of remuneration not exceeding the saving to the consignee in the hire of the barge, from the shorter time it would be engaged in his service."

* * * *

"There is another very important feature in favour of the plan; namely, that the tide being checked at London Bridge, and the current no longer allowed to run up through the bridge, carrying with it the impurities but just discharged by the ebbing tide, there will be but little upward current for some distance below the bridge, but the water will be forced vertically upwards by the pressure of the rising tide. The consequence of this will be, that the mud which has been carried away by the ebb will have very little tendency to return—its place will be taken by the pure water continually issuing from the dam; and there can be no doubt that the line of muddy water will be gradually pushed further and further down the river, until, as far as London extends, there will be comparatively clear water below, as well as above the bridge.

"Again: we shall probably hear no more of those disastrous floods, which at times have caused such damage." * *

"Another point of no small moment is the stopping at once the destructive scouring which endangers the foundations of so many of our bridges and wharves. Even London Bridge, the only one which would be exposed to any considerable current, may be rendered safe from any such effect."

For further arguments in support of Mr. Robinson's suggestion, the pamphlet must be consulted.

The Metropolitan Buildings Act, 18 *and* 19 *Vict. cap. CXXII.; and Notes of Cases Explanatory of its Law and Practice: with Appendices containing a List of District Surveyors, and the Unrepealed Sections of the* 8 *Vict. cap.* 84, *ss.* 54 *to* 63. By FREDERICK W. LAXTON, of the Middle Temple, Barrister-at-Law. London: Butterworth, 7, Fleet-street. 1855.

THIS is so valuable a compilation for professional men, that the commendations of

the press are scarcely required to gain for it a very extensive circulation.

MECHANICAL DEFECTS OF IRON SHIPS.

To the Editor of the Mechanics' Magazine.

SIR,—A report having appeared in the newspapers that the iron steamer *Pacific* had foundered, I am led to make a few practical remarks upon the inefficient construction of what are called iron ships. A sinking iron coffin would be a much more applicable term than a floating ship. The latter is obtainable in metal that can neither *leak* nor *sink*, exempt from dry rot, carpenters' wages for caulking and coppering, &c., cannot be eaten through with rats, and free from general damage, except in cases of stranding; and even then the vessel would be very little injured, if any. All this is practicable, if iron vessels were constructed upon *mechanical and scientific principles*.

All the things called iron ships afloat up to the present time are a long way short of being efficient:

1st. I would ask the question, Are all the people who build iron ships mechanics, or do they understand the rudiments of wooden ship-building?

2nd. Are the boiler-makers, and people who have been practising their avocation on iron ships, possessed of a mechanical intellect?

The science of ship-building has been more botched in constructing iron ships than any mechanical structure known up to the present day.

1st. From the cause that the men who first started building iron craft were not either mechanics or naval architects.

2nd. From the jealous feeling of wooden ship-builders, and,

3rd. The wooden ship-builder not knowing how to work iron to its best advantage.

And all the accidents that have occurred to iron ships have arisen from bad management, ignorance, and parsimony, the latter being the regulating point to start from; that is, specification of contract, and price regulated according to weight of material. When narrow-minded individuals are allowed to construct iron coffins in the form of floating ships to convey either goods or passengers, with only one-fourth to three-fourths of an inch between a living freight and eternity, the wonder is that there have not been more vessels foundering at sea.

The plates ought to be made of good iron, and have the makers' names stamped legibly upon them, as there has been a deal of bad iron made during the last three years, and some of it little better than cast iron. Should any of the ships built in the last four years meet with an accident from the cause of bad iron, the makers of it ought to be made a public example. I saw a vessel a short time ago that had been run into, that was built in the Clyde, and the quality of her plates was very bad, and looked more like cast than wrought iron. Plates have been made so as barely to stand the punch going through them, and plenty of the holes have been cracked in the riveting and filled up with red lead. The rivets ought to be made from the best wrought scrap iron, and not from the rolled round bars.

In the first place, the angle iron frame is rendered deficient by the holes that are punched through the side flange.

In the second place, the plates are weakened by the holes punched in them, and by having no aid from a longitudinal frame.

The frame of an iron ship should be T iron, both vertical and longitudinal, attached; and were this plan adopted, its rigidity would make it efficient within itself; so that, if only covered with a waterproof fabric, if immersed it would float without disuniting the joints.

The plating and riveting binding all together, it would be impossible for the plates to tear down when strain came upon them, as was the case in Her Majesty's steam frigates *Birkenhead* and *Nemesis*.

The water-tight bulk heads ought to be efficiently put in, so as to stand the pressure of the water, should any of the compartments get filled; and the Board of Trade ought to prosecute those shipowners who have the bulk heads cut, or the man-hole covers left out of them, or steam pipes put through them, and the joints not made secure.

An efficient iron ship ought to be constructed so as to take the ground when loaded, put at defiance wind and wave, and if beached through stress of weather should hold together, and not part in pieces from being cut through with the rivet holes at the bulk heads.

The climax of efficiency is practicable in ships composed of metal, and impossible to be accomplished in ships constructed in pieces of fibrous material, where their joints and seams are disconnected.

The insertion of these facts in your widely-spread publication may perhaps be the means of saving some of our fellow-creatures from a watery grave.

I am, Sir, yours, &c.,

JOHN CLARE, JUN.*

21, Exchange-buildings, Liverpool,
Nov. 20, 1855.

* From the *Manchester Courier* we extract the following.—ED. M. M.

" We are now in the middle of November, 1855,

ON THE TRISECTION OF ANGLES.

To the Editor of the Mechanics' Magazine.

* * * "A little ink,
Dropp'd rightly on the paper, may make people think." BYRON.
"I would evoke, to wake the world from sleep,
Immortal spirits from the vasty deep,"
SHAKSPERE *Travestie.*

SIR,—In a former number of your useful publication, there appeared what professed to be a practical solution of the famous and time-honoured problem of the trisection of plane angles, by Dr. Gillespie, of Edinburgh, but which was denominated by another correspondent of yours (Scholasticus), a "*practically impracticable*" attempt, only, at a solution.

However it may be as regards the learned doctor's solution being *true*, I believe that it is by no means *new*, as may be seen on reference to Bonnycastle's translation of "Bossut's History of the Mathematics," where the following passage occurs, at page 31:—

"The problem of the trisection of an angle, which is of the same nature as doubling the cube, was agitated in the school of Plato. Without attaining its solution, by means of the rule and compass, it was reduced at least to a very simple and curious proposition.

"This consists in drawing a straight line from a given point to the semi-periphery of a circle, which line shall cut this periphery, and the prolongation of the diameter that forms its base, so that the part of the line comprised between the two points shall be equal to the radius, a result which gives rise to several easy constructions." (This is identical with the Doctor's.)

Still the author gives us to understand this was not deemed satisfactory, and the problem has continued to occupy the attention, more or less, of mathematicians equally with the duplication of the cube and the quadrature of the circle down to the present time.

Buonaparte, who, when a student, was said to have been the first mathematician at the school of Brienne, which may, in some measure, account for his success in after life, once proposed at one of his *soirées*, given *à l'*Alexander the Great to his principal officers and the men of talent and learning about his court, another problem, which may rank side by side with the above stars, and complete the constellation; namely, the dividing a given circle into four equal parts geometrically, with the compasses only.

There are many who affect to despise such problems, but I hold them as venerable landmarks in the wilderness and ocean of learning; as the Montblanc, the Teneriffe and Atlas of the scientific world, whose tops touch heaven, and are seldom reached but by the most adventurous,—travellers, in whose life such an event forms a memorable epoch.

In this utilitarian age, there are many who affect to despise these ideas; but with such I am happy to contrast the opinion of Proclus, who asserts "that the end of geometry is to be referred to the energies of intellect, and that it is degraded when made to subserve the purposes of common life."

I hope, therefore, that you will insert this letter in your excellent miscellany, and that such of your readers will reply thereto as have anything good to say respecting the solution of these problems, and who can either solve them themselves, or give solutions approximate or otherwise from the publications of others.

I am, Sir, yours, &c.,
COSMOPOLITUS.

Star Point Lodge, Birmingham,
Nov. 24, 1855.

P.S.—I have been informed that General Paisley, in a work on military engineering, gives a solution of the trisection of an angle, and would feel obliged if you or any of your correspondents would communicate it.

and, strange to say, the Admiralty are still constructing vessels which have been shown to be altogether useless for the purpose for which they are intended. If there is really any intention of demolishing Cronstadt or St. Petersburg, why does not the British government at once cause vessels to be built that are capable of sustaining the fire of the Russian forts without injury? Mr. John Clare says it is quite practicable to construct vessels on scientific and mechanical principles, which will neither sink nor leak, which will be shot and fire-proof, of a light draft of water, and stand the concussion of large calibre guns. His plans have been laid before the Lords of the Admiralty, and it is their duty either to adopt them or to say why they do not. Perhaps, when Parliament meets, we shall have some explanation on the subject, as it is understood that our county member, Mr. William Brown, has promised to take it up. It is grievous to think that so much money should be squandered away in preparing unsuitable tools for carrying on the war."

IMPROVEMENTS IN ORDINARY FIRE-GRATES.

To the Editor of the Mechanics' Magazine.

SIR,—I wish to describe a slight addition to an ordinary fire-grate, which has been found to act very advantageously as an economizer of fuel, an economizer of heat, and a better means of ensuring ventilation in a room. With an ordinary fire-grate, the bars upon which the fuel is laid, are, of course, open, to allow the descent of cinders and ash, and probably also to admit air; at any rate, the quantity of air that passes through them is very considerable,

creating a sharp current up the chimney of air which has been lost to the room, and heat which is also lost; the fire burns in a spasmodic kind of way, and requires a great deal of attention and a great quantity of coals. But it has been found that the effect of the addition of a plate of iron immediately underneath the fire-bars (which plate is balanced on a hinge and knife-edge at the back of the grate, with a loop in front, so that the plate is in equilibrium, fitting close to the bars, but can, by pressure from the poker, be shaken down, to allow the ashes to descend, or even to fan the fire) has been to reduce the consumption of fuel 25 per cent., to ensure an equable fire, requiring no poking, and burning to a mere ash without waste; but to ensure a fire's working at all in this way, it is necessary that the room (and not the fire) should be well ventilated. This is obtained by a hollow chamber which passes from the external air at the back of an ordinary grate, and delivers itself in a longitudinal slit just below the mantel-piece. The air makes the circuit of the room (as tested by some smoke admitted), and returns to feed the fire and to carry up the chimney the products of combustion and exhalation. This system seems to combine, in a very excellent degree, ventilation, with economy of heat and perfect comfort—three things generally considered incompatible, but undoubtedly very desirable attainments.

I am, Sir, yours, &c.,

HERBERT LLOYD.

Kingston-on-Thames, Nov. 29, 1855.

BOYDELL'S TRACTION ENGINE.

To the Editor of the Mechanics' Magazine.

SIR,—I am much obliged to you for inserting my letter and explanatory diagram in your publication of last week, and I shall be further obliged by your correcting a remark made by you in reference to the former, viz., "that in your judgment the carriage should in both cases move in the same direction," as I feel confident, upon looking again at the drawing, fig. 4, you will do me the justice to admit that you said so under a misconception.

I am, Sir, yours, &c.,

JAMES BOYDELL.

Camden Works, Camden Town,
November 28, 1855.

[We have to thank our correspondent for calling our attention to the correction which requires to be made. The error probably arose from the fact that in fig. 4 the pulleys were, in the first instance, supposed to be fixed independently of the carriage, and not attached to it, as they were subsequently considered to be. It must not be supposed, however, from this explanation, that we assent to, or are even able to attach any meaning to the concluding assertion of Mr. Boydell's former letter, viz., that "if the upper weight keeps the carriage in equilibrium, it acts *twice as powerfully as the lower one.*"—ED. M. M.]

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BRIGHT, RICHARD, of Bruton-street, Westminster, lamp-manufacturer. *Improvements in lamps, and in lamp-wicks.* Patent dated April 20, 1855. (No. 886.)

Claims.—1. The adaptation to wick'd lamps of an extinguisher consisting of one or two tubes, as described. 2. The raising and lowering of the chimney of lamps without necessitating the removal of the globe by means of a rack and pinion or other equivalent therefor, as described. 3. The supporting of the globe holder or gallery in a suspended state, as described. 4. A mode of preventing overflow, and allowing for expansion of oil or other fluid in wick'd lamps, as described. 5. The adaptation of an indicator to moderator lamps, in the manner described. 6. The manufacture of lamp wicks by first saturating or impregnating yarns or cloths with fat or fatty matter, and the napping or raising a pile upon such yarns or cloths, then coating or covering the napped or piled surface with gum or other adhesive composition, and the cementing together of the edges of such yarns or cloths when forming argand or tubular wicks, all as described. 7. The adaptation of a metallic band to lamp wicks, for the purpose of preventing the descent of the flame lower than would be desirable, and of imparting firmness to the wick.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improved machinery for manufacturing bolts and other like articles.* (A communication.) Patent dated April 20, 1855. (No. 888.)

The general operation of the machine described by the patentee is as follows:—Iron of a size corresponding to that of the head of the finished bolt, or slightly smaller, is heated and submitted to the action of certain dies, after which it is carried to other dies, and the shank is drawn down. The form of the shank is then perfected by a cylindrical die, and the bolt is severed from the bar by other dies. The head is then perfected by a heading die.

PETTITT, EDWIN, of Manchester, Lancaster. *Improvements in preparing and spinning cotton and other fibrous substances, and in machinery for such purposes.* Patent dated April 21, 1855. (No. 890.)

Claims.—1. Compressing cotton or other fibrous substance into an uniform or nearly uniform density, and submitting it in a compressed state to the operation of carding. 2. Constructing either the ordinary carding engines or the machines described by the patentee with a compressing feeding apparatus. 3. The combination of a compressing apparatus with the ordinary blowing machine. 4. Constructing the ordinary throstle or bobbin and fly frame in combination with carding rollers.

HADFIELD, WILLIAM, of Manchester, spinner and manufacturer. *Certain improvements in looms for weaving.* Patent dated April 21, 1855. (No. 892.)

This invention consists of certain improved combinations of parts for governing the quantity of yarn let off the warp beam according to the tension of the warp.

SHARP, WILLIAM PRIOR, and WILLIAM WEILD, of Manchester, Lancaster, machinists. *Improvements in the manufacture, and in machinery for the manufacture, of spun or thrown silk threads.* Patent dated April 21, 1855. (No. 895.)

Claims.—1. The combination of the methods of spinning or manufacturing threads directly from cocoons with a certain process or method of crossing. 2. The application and adaptation for the purpose of spinning silk threads direct from the cocoon of certain "ring and traveller" mechanism. 3. The application and adaptation to machines for spinning, or for spinning and doubling, or for throwing silk, of the ring and traveller mechanism.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the consumption or prevention of smoke.* (A communication.) Patent dated April 21, 1855. (No. 896.)

This invention consists principally in the employment of a second fireplace behind the bridge of the furnace, such fireplace being composed of a number of fire-bricks or lumps, placed on edge in a longitudinal direction at small intervals apart, their front ends being bevelled or sloping to allow the incandescent fuel to rest thereon.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for spinning cotton and other fibrous materials.* (A communication.) Patent dated April 21, 1855. (No. 897.)

Claims.—1. A mode of driving the spindles of mules by gearing and friction combined. 2. An improved construction and arrangement of the framing or supports for the spindles and driving gear.

WINTER, WILLIAM, of Carlton-hill, Nottingham, manufacturer. *Certain improvements in the manufacture of warp looped fabrics.* Patent dated April 21, 1855. (No. 898.)

This invention consists—1. In a mode of ornamenting the said fabrics by interwoven spots or figures in suitable varieties of colour. 2. In a mode of effecting this object, by introducing into the mchinery for weaving the said fabrics three wheels, which actuate corresponding bars, suitably adjusted for working the threads to compose the said interwoven spots or ornamental figures.

SCHAEFFER, WILLIAM CHARLES THEODORE, of Bradford, York, manufacturer. *Improvements in the treatment of the waste wash-waters of wool and other mills.* Patent dated April 21, 1855. (No. 900.)

Claim.—The treating of waste wash-waters of wool and other mills, by adding thereto a solution of alum, sulphate of magnesia in its rough state as prepared in alum works, potash, salt, rock salt, or any other salt, for the purpose of separating the greasy, oily, and fatty matter from and contained in such wash-waters.

WALSH, SAMUEL, and JOHN HENRY BRIERLEY, small-ware manufacturer, of Stannary-works, Halifax, and Noble-street, Cheapside, London. *A clasp or fastener for belts, bands, or straps.* Patent dated April 21, 1855. (No. 901.)

The main feature of this invention consists in the means by which the inventors lengthen or shorten the belt, band, or strap, by the use of a hook attached to a bar, or by a bar with a projecting point or hook in the centre being attached to a plate of metal, or by a hook attached to a plate of metal a portiôn of which is cut away to allow the insertion of the material used for the belt, band, or strap.

BALAN, ALEXANDER, of Paris, France, engineer. *Improvements in transporting passengers and goods.* Patent dated April 23, 1855. (No. 902.)

A description of this invention will be given hereafter.

WHITWORTH, JOSEPH, of Manchester, Lancaster, engineer. *Improvements in ordnance, fire-arms, projectiles, and machinery for the manufacture thereof.* Patent dated April 23, 1855. (No. 903.)

We shall publish a description of the principal features of this invention shortly.

WRIGHT, JOSEPH, of Sussex-terrace, Islington, machinist, and EDWARD BRIMBLE, of Cheapside, Middlesex, warehouseman. *Improvements in the manufacture of stays or corsets, and in the means or method of fastening the same.* Patent dated April 23, 1855. (No. 904.)

Claims.—1. A method of making stays or corsets " with the seams transversely or across, and without gores, the cross or transverse seams being either straight or corrugated, thus throwing the strain or tension

principally on the material instead of the seams." 2. A method of fastening the same with metal or other tabs, as described.

Orr, John, of Glasgow, Lanark, manager, and James Templeton, of the same place, manufacturer. *Improvements in the manufacture of figured fabrics.* Patent dated April 23, 1855. (No. 905.)

Claims.—1. "The manufacture of a solid or undivided fabric, having a dead inner or centre warp, and with a complete and distinct pattern or device on each surface." 2. The use "of a dead inner or centre warp, operated upon by a Jacquard or other pattern-working mechanism, for the purpose of producing a solid or undivided fabric with a complete and distinct pattern or device on both surfaces."

Jenkins, Alfred, of Zell-on-the-Moselle, Prussia, engineer. *Improvements in furnaces for the reduction and calcination of lead and copper ores.* Patent dated April 23, 1855. (No. 906.)

The principal feature in the improved reverberatory furnace is, that one fire serves the double purpose of reducing and calcining the ore. The fire is contained in an ordinary fireplace situated at one end of the double furnace. The gases and flame from this fire pass through a lateral opening or flue into the reducing or flowing furnace, and, after passing over the surface of the ore contained therein, enter by another opening or openings into the calcining furnace, which is placed upon the same level, or nearly so, with the flowing furnace, the gases passing off by a suitable flue or flues to the chimney. In the passage or passages which conduct from the flowing furnace to the calcining furnace there are placed suitable doors or dampers, which are so arranged that by opening or closing certain of them the gases and flame may either be directed into the calcining furnace or cut off and turned into a waste flue leading to the chimney.

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *Improved machinery for separating substances of different specific gravity.* (A communication.) Patent dated April 23, 1855. (No. 907.)

This invention mainly consists in making the sieve box of hand gigs, which has an up-and-down motion, with apertures above the sieve or the equivalent thereof, when acting in and in combination with water in a surrounding tank or trough.

Gossage, William, of Widnes, Lancaster, chemist. *Improvements in the manufacture of certain kinds of soap.* Patent dated April 23, 1855. (No. 908.)

Claims.—1. The manufacture of compound soap by causing solution of soluble glass, or solution of silicate of soda, to be combined with soap produced by the union of tallow, resin, oil, or other such substances with soda, either by the method of working known to soap manufacturers as "close boiling without separation of lyes," or by the method of working known as the "cold process." 2. The manufacture of compound soap by causing resin, or such acid compounds as may be obtained from fats or oils by well known means, to become combined with solution of soluble glass, or with solution of silicate of soda, without requiring that such resin or such acid compounds shall be previously in the state of combination with alkali. 3. The manufacture of compound soap by causing resin to become combined with soda, and adding to the product such a proportion of wheaten flour or other farinaceous substance, or of some finely-divided argillaceous or silicious substance (such as China clay or ground flints) as will be sufficient to give such a degree of firmness to the compound soap produced as to render it suitable to be used as a hard soap for ordinary detergent purposes.

Richards, William Westley, of Birmingham, Warwick, gun-manufacturer. *An improvement or improvements in repeating or revolving fire-arms.* Patent dated April 24, 1855. (No. 911.)

This invention consists in applying to repeating or revolving fire-arms the mechanism of an ordinary gun lock with additions and modifications, of which we may publish a description hereafter.

Horsfall, Josiah, of Manchester, Lancaster, joiner. *Machinery for mitreing moulded and other sashes.* Patent dated April 24, 1855. (No. 912.)

This invention consists in a combination of machinery for mitreing sashes, by means of which manual labour is to be economized; and in the construction of certain suitable cutting tools.

Hunter, James, and George Hunter, both of Leysmill, Forfar, engineers. *Improvements in stone-cutting machinery.* Patent dated April 24, 1855. (No. 913.)

An illustrated description of this invention forms the first article of this number.

Utting, Frederic James, of Wisbeach, Cambridge, engineer and ironfounder. *Improvements in land-rollers and clod-crushers.* Patent dated April 24, 1855. (No. 915.)

These improvements consist in the combination of a series of cutting rings or wheels, having sharp edges, which may be either plain or serrated, with another series of rings or wheels formed with flat, or nearly flat edges, for the purpose of regulating the depth to which the cutting rings shall penetrate into the ground, and for rolling or levelling the same. The two sets of rings

are mounted on separate axles, and in revolving pass between each other.

MUIR, MATTHEW ANDREW, of Glasgow, Lanark, machinist. *Improvements in the manufacture or moulding of railway chairs.* Patent dated April 24, 1855. (No. 916.)

This invention mainly consists in the use, in apparatus for moulding railway chairs, of saddle pieces, or of separate supporting pieces, such saddle or supporting pieces being formed with projections, feathers, or recesses for determining the position of the core pieces for forming the open-jaw portion of the chair, the core pieces being formed with corresponding recesses, feathers, or projections. The chairs are made with spike holes rounded off below.

SMYTH, CHARLES PIAZZI, of Hillside-crescent, Edinburgh. *Improvements in astronomical and geodetical instruments.* Patent dated April 24, 1855. (No. 917.)

A full description of this invention will shortly be given.

COCKCROFT, HENRY, of Haslingden, Lancaster, stationer. *A self-registering letter-box.* Patent dated April 25, 1855. (No. 919.)

Claim.—The application to letter-boxes of a self-registering apparatus for indicating the presence or absence of letters.

AVISSE, LOUIS ALEXANDRE, of Paris, France, pianoforte manufacturer. *Improvements in lubricating revolving shafts of all descriptions, and also the axles of railway and other wheels.* Patent dated April 25, 1855. (No. 921.)

The invention describes an arrangement of parts by which the revolving axles are always kept partially immersed, and with which is a graduated glass gauge for indicating the quantity and state of the lubricating material.

WALLACE, JAMES, junior, of Glasgow, Lanark, manufacturer. *Improvements in bleaching, washing, or cleansing textile fabrics and materials.* Patent dated April 25, 1855. (No. 923.)

This invention mainly consists in a mode of aiding the action of dash-wheels or rotating chambers used in cleansing textile fabrics and materials by introducing steam therein, and in a mode of bleaching textile materials in ordinary dash-wheels or in rotating chambers with the aid of bleaching agents and steam.

MASON, MARK, of Dukinfield, Chester, machinist. *Improved machinery or apparatus for manufacturing metallic sole-tips and heels for clogs, boots, or other coverings for the feet.* Patent dated April 25, 1855. (No. 924.)

Hitherto sole tips and heels have been made by manual labour, for which the inventor proposes to substitute machinery; he gives a description of apparatus suitable for the purpose.

VICTORY, JOHN JOSEPH, of Henrietta-street, Middlesex, carpenter. *Certain apparatus for marking out curved lines upon wood and stone, specially adapted to the marking out of hand railings, together with improved machinery for boring and sawing wood.* Patent dated April 25, 1855. (No. 925.)

An illustrated description of this invention will be given hereafter.

BLACK, JOHN, of Hampstead-road, Middlesex, sculptor. *Improvements in axles, shafts, and bearings.* Patent dated April 25, 1855. (No. 926.)

These improvements consist—"1. In providing a revolving shaft, or axle, fitted with a pair of fixed endless rail bearings or supports placed in a suitable position and recessed so as to form a reservoir in the centre, and receive a lubricator collar or ring rising above the horizontal line of the said shaft or axle, cast upon or fitted to the shaft or axle, by which it is considerably strengthened; the reservoir is fitted with oil or other lubricating material, which is taken up by the lubricator on the shaft as it revolves and distributes it over its fixed endless rail bearings and axle, so as to lubricate them. The bearing is also provided with one, two, or more chambers for containing a supply of lubricating materials. These chambers are placed at the side of the centre reservoir in which the lubricator revolves independently, as it is in contact with nothing but the oil or other lubricating material, or in any other convenient position, and communicate with it through an aperture or passage. The lubricator on the axle may be rectangular, round, or of any other convenient shape. For carriage axles the inventor prefers to place the fixed endless rail bearings in the carriage spring bed, or to fit it in the block fixed to the carriage spring. 2. In fitting a pair of revolving endless rail bearings, collars, or rings at each end of the nave or stock of a carriage or other wheel which revolving endless rails form bearings for the axle, and prevent it from touching the inside of the nave or stock, the space inside the nave, around the axle, between the rings, or revolving endless rails forming a chamber for the reception of oil or other lubricating material. The revolving endless rails, or rings, or collars, fitted at each end of the nave or stock, may be constructed round, straight, or rectangular, or of any other convenient shape."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *An improved gas-regulator.* (A communication.) Patent dated April 25, 1855. (No. 929.)

This invention consists, says the patentee, "in a certain arrangement of an inverted floating cup upon which the gas acts,

[redacted]

to control the opening of the induction or regulating valve, combined with the application to the said cup of an air spring or its equivalent, for the purpose of increasing and diminishing the resistance of the said cup to the pressure of the gas, as the pressure in the pipe increases or diminishes by reason of a less or greater consumption or otherwise."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Improvements in the manufacture of seamless garments or other useful articles of felt.* (A communication.) Patent dated April 25, 1855. (No. 930.)

The hardening having been accomplished by a described process, "the bat is taken," says the patentee, "from the machine, and all the soft unfelted parts removed, except those necessary to be retained to effect the union of the several parts to form the article desired. Having prepared the bat, and obtained margins of soft unfelted wool, the perfect union of the several parts is to be effected simply by felting, as in the old and well-known process of forming felt-hat bodies."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Improvement in scales or machines for weighing.* (A communication.) Patent dated April 25, 1855. (No. 931.)

This invention mainly consists in "the application of a weight or poise to a scale beam or balance, so that when the slightest preponderance is given to one arm of the beam or balance which is left free to descend, and the descent of the said arm commences, the said weight will become effective to increase the said preponderance."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *A new and improved lock for sliding doors.* (A communication.) Patent dated April 25, 1855. (No. 934.)

This invention consists in the combination of a catch and sliding bolt arranged in a certain described manner.

ANGER, FRANÇOIS JOSEPH, of Stamford-street, Blackfriars-road, Surrey, merchant. *A new metallic alloy.* (A communication.) Patent dated April 25, 1855. (No. 935.)

"I melt in a crucible," says the inventor, "100 parts of good copper, and while in a perfect state of fusion, I add 17 parts of zinc, 6 parts of magnesite, or substance of a like nature, though perhaps differing in name, 3·6 parts of ammonia or salts of ammonia, 1·8 parts of quick lime or other calx, and 9 parts of crude tartar. The crucible is then covered, and the whole allowed to come to a complete state of fusion." The metal resulting from the above combination is said to resemble gold in several of its properties.

DRAPER, SAMUEL, of Lenton, near Nottingham. *Improvements in apparatus for retarding and stopping railway trains.* Patent dated April 25, 1855. (No. 936.)

"This invention consists in employing fluid to uphold railway carriages when in motion, in such manner that, on any requirement for use of the breaks or apparatus for offering friction to the wheels, or to the surface of the rails to retard or stop the carriage of a railway train, they will be called into action on the fluid being allowed to flow out of the vessels containing it."

JEFFREYS, JULIUS, of Kingston-hill, Surrey. *Improvements in engines or machines for raising, diffusing, or injecting fluids.* Patent dated April 25, 1855. (No. 937.)

These improvements relate to machines used for domestic purposes, and consist—1. "In the use in general of pumps formed of compressible sides or cylinders, in lieu of a piston. 2. In so adapting them, that the foot may be employed to work pumps if desired. 3. In employing the elasticity of compressed air to maintain a continuous stream. In the case of two machines, in avoiding altogether conveying through the pumps the liquid to be propelled by pumping air upon it."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

DRURY, JOHN, of Paddock, near Huddersfield, York, machine-maker. *Improvements in steam boilers for preventing explosion thereof.* Application dated April 20, 1855. (No. 889.)

This invention consists—1. In the use of a certain warning whistle. 2. In a mechanical arrangement for extinguishing the fire when there is too small a quantity of water in the boiler. 3. In a self-acting mechanical arrangement of feed-valves for admitting water into the boiler when the feed-pump ceases to perform its office properly.

GERHARDI, WILLIAM, of Manchester, mechanic. *Improvements in apparatus to prevent the lapping of straps round shafts.* Application dated April 21, 1855. (No. 891.)

This invention consists in applying a loose bush on each side of every pulley or drum on the driving shaft, so that when a strap falls from the pulley or drum, it drops on the loose bush, and the weight of the strap prevents the bush revolving with the shaft.

BARRETT, JOHN, of the Minories, London. *Improvements in smiths' hearths.* (A communication.) Application dated April 21, 1855. (No. 894.)

The object of this invention is to con-

struct a smith's hearth closed at top and at three sides, and having an opening in front for introducing the iron to be heated.

EDWARDS, WILLIAM ALEXANDER, of Brook-street, West-square, Lambeth, Surrey, engineer. *Separating certain metals from metallic substances.* Application dated April 21, 1855. (No. 899.)

This invention consists in subjecting metallic substances to the action of an electro-magnet, produced by placing a revolving piece of iron in the centre of a coil, the end of which projects, and is placed in connection with an electric battery. The magnet extracts the iron and steel from the other metals with which they are mixed.

TAYLOR, JOSEPH, of King-street, Westminster, gentleman. *Improvements in propelling vessels.* Application dated April 24, 1855. (No. 910.)

"I provide," says the inventor, "a spur-wheel keyed to the paddle shaft, above which is arranged a toothed pinion, secured in a proper frame made to slide, when operated by forked levers one on each side, and connected with notched levers, the raising or depressing of which by a vertical or other screw causes the motion of the same and consequent rotation of the propeller shaft."

MC KENNA, FRANCIS, of Salford, Lancaster, manager. *Certain improvements in power-looms for weaving.* Application dated April 24, 1855. (No. 914.)

The inventor dispenses with the upper or "sand roller," and in lieu thereof employs a lever, one end of which presses beneath and upon the fabric of the cloth or winding-on roller, the other end being worked from a cam or other mechanical equivalent secured upon the tappet-shaft. In connection with this lever is a second, placed at right angles to it, and receiving from it an up-and-down motion. The one end of the second lever carries a click, which, working in a ratchet-wheel, causes the partial revolution of a worm on the same shaft, and through it of a worm-wheel secured to the winding-on roller. As the diameter of the cloth on the "winding-on" roller increases the end of the first lever beneath it becomes gradually depressed, thus lessening the number of teeth of the click-wheel taken up by the click upon the second lever.

JORDAN, CHARLES, of Newport, Monmouth, ironfounder. *An improvement in discharging cannon.* Application dated April 24, 1855. (No. 918.)

This invention consists in applying to the touchhole of a cannon a plug, with a recess in it to receive a red-hot shot, which, on the turning of the plug, drops on to the charge of powder and ignites it, the plug at the same time closing the touch-hole.

CROSSKILL, ALFRED, of Beverley, York, civil engineer. *Improvements in machinery for cutting and reaping corn, grass, and other crops.* Application dated April 25, 1855. (No. 922.)

This invention consists in applying to the axles of such machines when they are driven by two driving wheels, an arrangement of ratchet wheels which will enable the two driving wheels to revolve independently of each other when they are both driving the working parts of the machine.

HUNTER, JOHN, of Liverpool, Lancaster, gentleman. *Improvements in the distillation of turpentine and other resinous substances.* (A communication.) Application dated April 25, 1855. (No. 927.)

This invention consists of a method of "applying alkalies, or the salt or salts of alkalies, or alkaline solutions or substances, in the preparation of crude turpentine or other resinous matter previous to and during the process of distillation. The alkaline preparations, varying according to the properties of the crude materials, are distilled with these materials."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *A new and improved machine for planing screw-nuts and bars of any prismatic form.* (A communication.) Application dated April 25, 1855. (No. 928.)

This invention consists in attaching a series of cutters to the periphery of a rotating disc, such cutters being so arranged or attached to the disc, that each will project a trifle further out from the centre of the disc, than the one immediately behind it, so that the whole of the cutters during revolution are caused to plane or pass over a surface equal in width to one side of the nut, or bar to be planed.

WILKIN, JOHN BRYANT, of Helston, Cornwall. *Improvements in stamping and dressing or separating ores of any kind, but more especially tin ores.* Application dated April 25, 1855. (No. 932.)

This invention "consists in attaching cranks and sweep rods to the axle of the water-wheel or other motive power, connecting a stamping axle, on which are also cranks, the stampers being operated in any suitable manner."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *An improved chaff-cutting machine.* (A communication.) Application dated April 25, 1855. (No. 933.)

The inventor employs two or more rotating cutters, operating in connection with a vibrating bed, which is connected to a shaft. The under surface of the bed is slightly convex, and just touches the edges of the cutters when in a vertical position, &c.

HUDDART, GEORGE AUGUSTUS, of Brynkir, Carnarvon, Esq. *Improved machinery for obtaining motive power from running waters.* Application dated April 25, 1855. (No. 939.)

"This invention relates to the employment of a system of buckets attached to endless chains, set up vertically, or nearly so, and working over suitable guide rollers."

PEABODY, JOSEPH, of Old Broad-street, London, gentleman. *An improved construction of hay-making machine.* (A communication.) Application dated April 25, 1855. (No. 940.)

This machine consists mainly of a rectangular frame supported at its ends by skids (instead of wheels), which slide over the ground. In the middle of the frame a central driving wheel has its bearings. This wheel runs over the ground as the machine is drawn forward by a horse, and communicates the rotary motion, which it thus receives through suitable gearing, to a pair of scatterers, mounted on either side of the driving wheel, in bearings in the rectangular frame.

PROVISIONAL PROTECTIONS.

Dated August 29, 1855.

1953. John Hanson, of Doagh, Belfast, Antrim, land agent and farmer. Improvements in machinery or apparatus for digging or working land, and removing roots or plants therefrom.

Dated September 6, 1855.

2019. James Fraser, of Jermyn-street, Middlesex, gentleman. An improvement in the manufacture of paper. A communication.

Dated October 13, 1855.

2291. John Dewrance, of Barge-yard, Bucklersbury, London, engineer. An improvement in the frames of pianofortes.

Dated October 27, 1855.

2398. Henry Wyatt, of Pall-mall, Middlesex. A peculiar apparatus for more rapidly and perfectly manœuvring or steering steam ships of war or of commerce, which is entitled "The Transpulsor."

Dated October 29, 1855.

2411. John Kennard, of Little Queen-street, Holborn, Middlesex. An improvement in the manufacture of childrens' and invalids' carriages.

2413. Germain Jean Paul Marie Villeroux, of Paris, France. Certain improvements in the manufacture of soap.

2415. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in regulating the transmission of motive power. A communication from François Theophile Moison, of Mouy, France, mechanician.

Dated October 30, 1855.

2417. Paul Emile Chappuis, of Fleet-street and St. Mary-axe, London. Improvements in reflectors for the diffusion of artificial light.

2419. William Naylor, of Norwich, engineer. Improvements in power hammers and rivetting machines.

2421. Thomas Hocroft, of Tividale, Stafford, iron roller, and Richard Forrest, of Tipton, manager. Improvements in the manufacture of iron rods, bars, hoops, merchant, and guide iron.

Dated October 31, 1855.

2423. William Henry Walenn, of Regent-street, Middlesex. Self-acting attachment to be applied to gates. A communication from Henry Davis, of the United States.

2425. James Gray Lawrie, of Glasgow, engineer. Improvements in ship-building, to facilitate the use of water as ballast.

2427. Henry Edwin Drayson, of Maresfield Powder Mills, Sussex. An improvement in the manufacture of gunpowder.

2429. Thomas James Swinburne, of South Shields, Durham, plate glass manufacturer. Improvements in furnaces or apparatus used in the manufacture of glass.

2431. Richard Pannell Forlong, of Bristol, manure manufacturer. An improved manufacture of manure.

Dated November 1, 1855.

2435. Henry Laxton, of Arundel-street, London. Improvements in gearing for increasing or decreasing rotary speed. A communication.

2437. George Milner, of Hollen-street, Wourdour-street, Middlesex. Certain improvements in the manufacture of bedstead bottoms, part of which improvements are applicable to various other purposes for commercial and domestic use.

2439. William Taylor, of Haughton, near Shiffnal, Salop, manufacturer. An improvement or improvements in the manufacture of iron.

2441. Joseph Bentham, of Bradford, York, commission agent. Improvements in looms for weaving.

2443. Robert Kerr, of Glasgow, Lanark, manufacturer. Improvements in spinning together fibrous materials of different kinds.

2445. William Henry Walenn, of Regent-street, Middlesex. Certain improvements in pianofortes. A communication from Spencer Bartholomew Driggs, United States.

Dated November 8, 1855.

2518. Louis Gasté, of Paradis Poissonnière, Paris. Improvements in binding account and other books.

Dated November 9, 1855.

2522. George Barry Goodman, of York-buildings, Marylebone, Middlesex, and George Alfred Webster, of York-buildings, gentlemen. Improvements in apparatus for reflecting the back, front, and sides of the figure and head in a mirror or toilette glass at one view.

2524. James Bramwell, of Royal Exchange-buildings, London, merchant, and John Crawford, of Newcastle-upon-Tyne, engineer. Improvements in ordnance.

2526. Charles Joseph Hampton, of Llynrivale, Llangynwyd, Glamorgan, manager of iron works. Improvements in the manufacture of iron.

Dated November 10, 1855.

2528. William Peter Piggott, of Oxford-street, Middlesex, medical galvanist. Improvements in galvanic, electric, and electromagnetic apparatus, and in the mode of applying the same as a curative and remedial agent.

2530. Joseph Scott, of Glasgow, Scotland, glass merchant. Improvements in corking bottles, jars, and other receptacles.

2532. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in transmitting fac-simile copies of writings and drawings by means of electric currents. A communication from Giovanni Caselli, of Florence.

2534. Henry Wickens, of Tokenhouse-yard, London. Improvements in locomotive steam engines, and in apparatus in connection therewith, parts of which improvements are respectively applicable to other steam engines and purposes.

Dated November 12, 1855.

2536. Jules César Alexandre Bouillotte, of Paris, France. An improved letter copying-press.

2538. William Kemble Hall, of Cannon-street, London, engineer. The prevention of steam boiler explosions.

2542. John Yuil Borland, of Manchester, Lancaster. Improvements in spinning and machinery for preparing and spinning fibrous materials.

2544. Joshua Kidd, of Newgate-street, London. Improvements in machinery and apparatus for sewing or stitching and ornamenting cloth or other fabrics.

2546. John Henry Johnson, of Lincoln's-inn fields, Middlesex, gentleman. Improvements in casting metals. A communication from Jackson Brothers, Petin, Gaudet, and Co., of Rive de Gier, France, engineers.

2548. William Carr Thornton, of Cleckheaton, York, machine maker, and Benjamin Thornton, of the same place, machine maker. Improvements in machinery or apparatus for preparing and spinning wool, which improvements are also applicable to washing and wringing machines for the same material.

Dated November 13, 1855.

2552. Julius Homan of Milk-street, Cheapside, London, manufacturing outfitter. Improvements in machinery for cutting up woven and other fabrics.

2554. William Webb and John Webb, junior, of Birmingham, Warwick, builders, and James Catstree, of the same place, brass founder. Improvements in attaching door knobs to spindles.

2556. Frederick Abraham Eskell, of Manchester, Lancaster, dentist. Improvements in plates for attaching artificial teeth.

2558. William Foster, of Black Dike Mills, near Bradford, York, spinner and manufacturer. Improvements in machinery or apparatus for drying wool and other fibrous materials.

Dated November 14, 1855.

2560. Henry Laxton, of Arundel-street, London, architect and civil engineer. Improvements in fire-arms. A communication from Benjamin F. Joslyn, of Worcester, Massachusetts, United States.

2562. Thomas Skinner, of Sheffield, York, silver plater. Improvements in producing figures or ornaments upon the surfaces of metals.

2564. Cyprien Marie Tessié du Motay, of Paris. Improvements in the manufacture of lubricating materials.

2568. George Tomlinson Bousfield, of Sussex-place, Loughboro-road, Brixton, Surrey. An improved safety coal-hole cover. A communication.

2570. Edmond Godefroid Cox, manufacturer, of Lille, French Empire. Certain improvements in picking or cleaning cotton, wool, and other filamentous substances.

Dated November 15, 1855.

2574. John Talbot Pitman, of Gracechurch-street, London. Improvements in the construction of iron beams and girders, and in machinery for making the same. A communication.

2576. Joseph Lester Hinks, of Birmingham, Warwick, manufacturer. An improvement or improvements in brushes.

2578. William Lea, of the firm of William and John Lea, of Wolverhampton, Stafford, manufacturer. An improvement or improvements in taps or cocks.

2580. Duncan Morrison, of Bordesley Works Birmingham. An improvement in the manufacture of articles with internal screws, when cast iron, malleable cast iron, or cast brass is employed.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November 27th, 1855.*)

1534. Henry Crosley. Improvements in projectiles and the manufacture thereof for ordnance cannon, rifles, muskets, and all descriptions of small arms, and also in the mode or modes of loading, using, and working the same.

1571. George Tomlinson Bousfield. Improvements in the manufacture of boots and shoes. A communication.

1610. Felix Hoyos. Improvements in roasting-spits.

1621. Auguste Edouard Loradoux Bellford. Improvements in the valves and passages for effecting the induction and eduction of steam in steam engines. A communication.

1626. Samuel Barlow Wright and Henry Thomas Green. Improvements in the manufacture of bricks and tiles.

1655. Samuel John Pittar. Improvements in the construction of bridges. Partly a communication.

1661. Theophilus Henry Hastings Kelk. Rendering certain vegetable substances useful for the manufacture of paper and the formation of textile fabrics and cordage or ropes.

1668. Auguste Achard. Improvements in the application of electricity as a transmitting agent of motive power.

1698. Thérèse Alexandrine Poncelin. Improvements in treating or preparing coffee.

1710. William Bridgewater. Certain improvements in the manufacture of roofing and other tiles.

1749. James Saunders. An improved roller for cloths and other fabrics.

1810. William Mickle. Improvements in smelting or producing iron from ore in blast furnaces.

1819. Pontus Lagergren. Improvements in paddle wheels.

1831. Lewis Normandy. A new circular weaving machine. A communication.

1851. John Avery. An improved apparatus to be applied to drawers to secure them, and to give notice when any attempt is made to open the same by any improper person. A communication.

1912. William Kidman. An improvement in tillers or yokes.

1939. Samuel Ludbrook. Improvements in railway wheels.

1953. John Hanson. Improvements in machinery or apparatus for digging or working land and removing roots or plants therefrom.

1988. William Henry Zahn. Improvements in machinery for making covered or plated twist and cord.

1996. William Woodcock, Thomas Blackburn, and James Smalley. Improvements in the pistons of steam engines, which improvements are also applicable to pump buckets.

2100. Auguste Edouard Loradoux Bellford. Certain improvements in fountain lamps. A communication.

2124. Ursurer Joseph Brasseur. Improvements in machinery for winding weft. A communication.

2129. Joseph Beattie. Improvements in furnaces and boilers for the generation of steam, and in apparatus for the application and treatment thereof.

2135. Alfred Vincent Newton. An improved

mode of casting solid and hollow articles in metal. A communication.

2175. Joseph Beattie. Improvements in the construction of railway wheels and axles.

2247. William Edward Newton. Improvements in condensers. A communication.

2259. Narcisse Leroy. Improvements in the construction of railway carriages.

2277. John King Westrop and Edward Alfred Sharman. An improvement in the manufacture of gloves made of looped fabrics, of silk, cotton, and linen.

2297. Manuel Perez Lozano. Improvements in treating pyrites and ores containing sulphur, in obtaining sulphuretted hydrogen, and in precipitating copper from solutions. A communication.

2299. John Stenhouse. Improvements in the preparation of decolourising materials.

2311. Edwin Wilkinson. An improved mode of extracting grease from woollen, cotton, and worsted waste.

2317. Henry Bessemer. Improvements in the manufacture of anchors.

2319. Henry Bessemer. Improvements in the manufacture of railway bars.

2323. Henry Bessemer. Improvements in metal beams, girders, and tension bars, used in the construction of roofs, floors, and other parts of buildings, and in the construction of viaducts and suspension and other bridges.

2325. Henry Bessemer. Improvements in the manufacture of ordnance and in the projectiles to be used therewith.

2327. Henry Bessemer. Improvements in the manufacture of railway wheels.

2335. William Glass. Improvements in obtaining a deodorizing and disinfecting material.

2362. Pierre Alexandre Leroux and Louis Réné Martin. Combining a resinous matter with oils or fatty bodies in order to obtain various useful products therefrom.

2371. Thomas Richardson. Improvements in the manufacture of glass and clay-wares.

2377. Jacques Rives. Improvements in looms for weaving.

2381. John Edwin Mayall. Improvements in hotography.

2391. John Andrew Richards. Improvements in producing the "hard grain" on leather.

2400. John Davie Morries Stirling. Improvements in the manufacture of cast steel tubes and cylinders applicable especially in the manufacture of cannon, mortars, and other guns, also steam and other cylinders.

2419. William Naylor. Improvements in power hammers, and rivetting machines.

2430. Thomas Shipp Grimwade. Improvements in treating milk in order to preserve it.

2442. Auguste Edouard Loradoux Bellford. Improvements in sewing machines. A communication.

2443. Robert Kerr. Improvements in spinning together fibrous materials of different kinds.

2446. Edwin Thomas Truman. Improvements in palates or holders for artificial teeth.

2462. William Robertson and James Henry. Improvements in machinery for reaping and mowing corn or other agricultural produce.

2464. James Greenshields. Improvements in he manufacture or production of drying oleaginous compounds.

2472. Richard Archibald Brooman. Improvements in generating motive power. A communication.

2484. Thomas Thomas, the younger. Improvements in the manufacture of soap.

2486. Alexander Charles Louis Devaux. Improvements in the construction and the fitting up of granaries.

2492. Richard Threlfall and John Higson. Improvements in machinery or apparatus used in preparing or sizeing and dressing yarns for weaving.

2506. John Wakefield. Improvements in machinery for working the slides and steam valves of engines driven by steam or other elastic fluid.

2532. Alfred Vincent Newton. Improvements in transmitting fac simile copies of writings and drawings by means of electric currents. A communication.

2546. John Henry Johnson. Improvements in casting metals. A communication.

2558. William Foster. Improvements in machinery or apparatus for drying wool and other fibrous materials.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

847. Henry Thomson.
850. William Henry Winchester.
853. Stephen Spalding.
865. Charles Harford.
867. Charles Iles.
870. James Ward Hoby and John Kinniburgh.
884. Robert Barnard Feather.
887. Thomas Wood.
890. Mathurin Jean Prudent Moriceau.
919. James Barlow.
939. James Newall.
942. Peter Walker and Andrew Barclay Walker.
983. John Henry Johnson.
985. William Mayo.
991. Thomas Lovell Preston.
1070. Clement Dresser.

1853.

174. David Clovis Knab.

LIST OF SEALED PATENTS.

Sealed November 13, 1855.

1117. Frederick Delacourt Blyth.
1121. Charles Claude Etienne Minié.
1133. Frederick William Mowbray.
1185. Joseph Hippolyte Poullain.
1187. Henry Henson Henson.
1249. Thomas Worsdell.
1250. Richard Archibald Brooman.
1363. James Timmins Chance.
1757. Auguste Edouard Loradoux Bellford.
1763. Henry John Betjemann.
1913. Thomas Bartlett.
1975. Frederick Crace Calvert.
2037. James Bird.

Sealed November 16, 1855.

1108. Robert Vezey and Edmund Vezey.

1118. James Rae.
1125. William Henry Dearing Granville.
1126. Robert John Stainton and Edmund Charles Davey.
1134. Thomas Piggott.
1139. Ignace Joseph Silbermann, jun.
1145. William Mac Naught.
1147. James Shanks.
1149. John Henry Johnson.
1151. Henry Emmanuel Scott.
1180. George Horrocks.
1199. Charles Weightman Harrison.
1230. George Rogers.
1264. François Celestin Armelin, jun.
1298. Pierre Antoine Favre.
1306. Charles Constant Joseph Guffroy.
1308. Richard Peters.
1344. John Charles Brant.
1361. Felix Leloup.
1402. John Henry Johnson.
1438. John Gay Newton Alleyne and Henry Strafford.
1440. Stanislas Tranquille Modeste Sorel.
1490. William Woodcock.
1588. Edwin Senior Atkinson.
1608. Walter Christopher Thurgar.
2098. James Tennant Caird.

Sealed November 20, 1855.

1127. Walter Henry Tucker.
1137. Harry Whitaker.
1164. William Smith.
1172. Charles Rawlings.
1210. Samuel Rowlands.
1226. Edward John Payne.
1228. William Langshaw and George and William Jelley.
1292. George Hopper.
1320. Masta Joscelin Cooke.
1460. François Vennin Derégniaux.
1640. Henry Duncan Preston Cunningham.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1687.] SATURDAY, DECEMBER 8, 1855. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

HUTCHINS' ROTARY ENGINE.

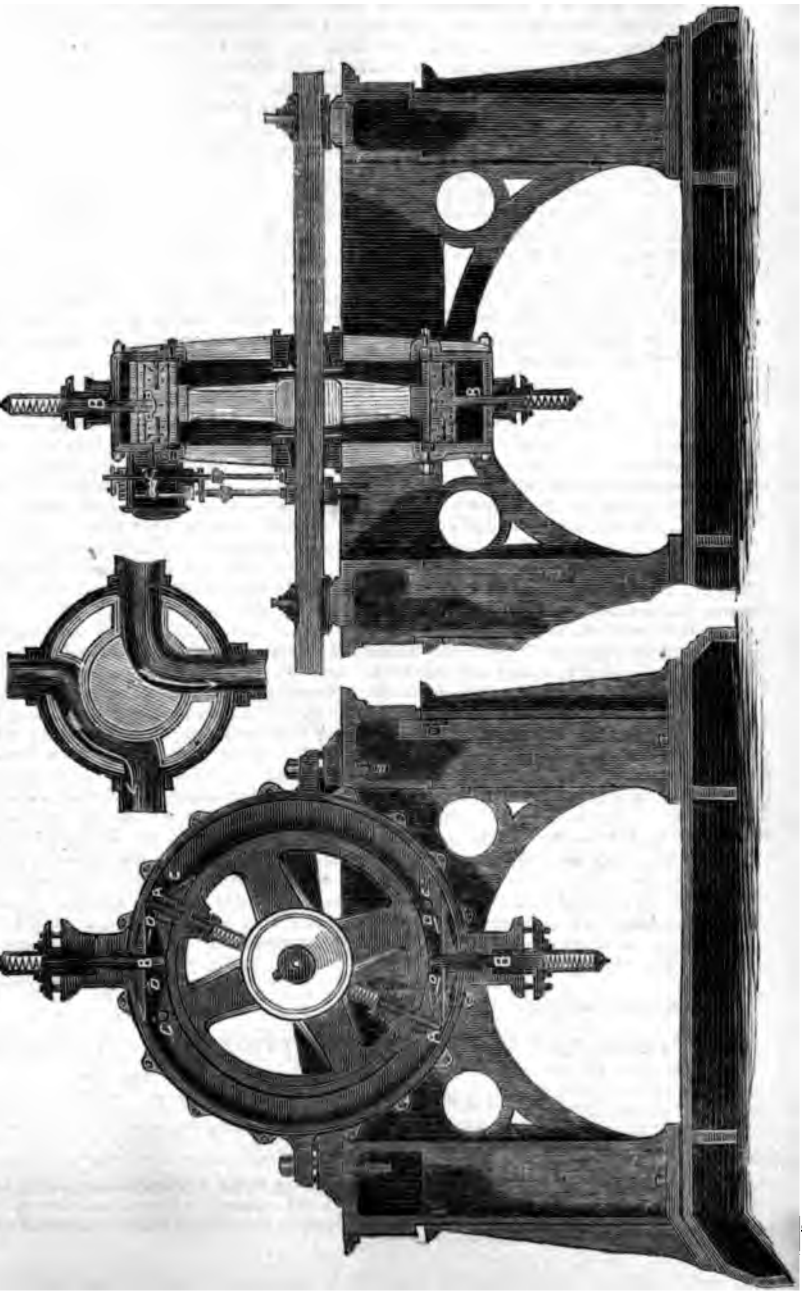


Fig. 1. Fig. 3. Fig. 2.

HUTCHINS' ROTARY ENGINE.

Patent dated July 24, 1854.

To the Editor of the Mechanics' Magazine.

SIR,—This engine is planned with the view of overcoming the objections that have attached to most, if not all former rotary engines, on the score of unequal, rather than excessive friction, and it will be seen on examining the engraving that all eccentric motion —one great cause of unequal wear—is avoided in the main parts, and, at the same time, by keeping the difference in diameter between the inner and outer sides of the cylinder as small as possible, there is no great inequality in the friction on the pistons. Another fact may be noticed here, namely, that as the friction is proportionate to the distance of the point of contact from the axis of rotation, so by increasing the width of the cylinder without increasing its depth, I can gain power without a corresponding increase of frictional loss. I have also allowed means for compensation of wear from friction, by packing, the neglect of which, in some rotary engines, appears to be contrary to the rules of common sense and nature. By attention to the above particulars, it is expected that the friction will not be found more destructive in this engine, than it is in one with a straight cylinder. Another advantage which I claim for this invention, is the use of the eccentric motion for the admission and cut off of the steam, thus making it suitable for a high-pressure engine, and, at the same time, by the addition of an air pump, it may be used as a condensing engine. For driving screw vessels and for locomotives, it is believed that this engine will far excel all in present use.

The following is a brief description of the accompanying engraving, and of the way in which the engine is worked. The outer or fixed cylinder is formed with one side to remove, for convenience both of construction and repair; the inner or rotating cylinder is formed like a broad wheel, keyed on the main shaft, on the tire of which are bolted the piston heads, A A. These are furnished with a sloping piece on each side, between which they can run when passing by the cut off valves, B B. These valves have similar sloping pieces, which are for the purpose of pushing in the pistons when passing, and the same office is performed on the cut off valves by the sloping pieces on each side of the piston. Both the pistons and cut off valves have rods passing through stuffing boxes, and are kept home by springs on the outside of the cylinder. The motive power is applied in the following manner; the steam being admitted at either the forward or backward induction ports, marked D D, and D′ D′, it presses forward the pistons until they pass the eduction ports, C C, or C′ C′, and escape takes place; but this is so timed by the position of the latter, that the piston will have nearly passed the cut off valve before the steam is exhausted; thus the dead point is almost only nominal. As soon as the piston has passed the cut off valve, admission, by means of the eccentric, commences, and the motion is continued, the supply of steam being cut off at any regulated point. The engraving shows two pistons, which have the advantage over one of counter-balancing the strain, and also of reducing the size of the cylinder one-half; but my specification does not limit me to any number of pistons. The eccentrics each work two valves over the opposite induction ports, by means of two bands and rods to each. The eduction ports are simply apertures, covered with metal valves, which can only open outwards into the same steam box in which the induction ports are placed, so that when steam is admitted to the latter, the pressure keeps the former close. My method of reversing the engine, &c., is shown by the figure 3, which is a four way cock, by a quarter turn of which the engine is reversed, by an eighth part turn it is stopped, and by partly turning it, so as to partially stop the supply. I purpose using, in connection with this engine, the annular feed pump governor, worked by an eccentric in the usual manner. Hoping that your readers may agree with me in my estimate of this engine,

I am, Sir, yours, &c.,

ED. HUTCHINS.

New-road, Whitechapel.

ARE LIEBIG'S LAST VIEWS ON FERMENTATION AND PUTREFACTION TRUE?

BEING A SECOND MEMOIR ON THIS SUBJECT.

BY HORATIO PRATER, ESQ., M.D., &c., &c.

(*Continued from page* 512.)

SUGAR seems to be a necessary element *in the process of fermentation*. Thus *Berzelius* says, "When we express the juice of a vegetable production *containing sugar*, as for example, grape, gooseberry, beet-root, or carrot, and leave it exposed to the

air, *at a certain temperature*, fermentation ensues."*

After this statement we may understand how it is that *some* vegetable juices do not enter into fermentation under the above circumstances, since they do *not contain sugar, or sugar in sufficient quantity*. And now we come to Liebig's question, "Why, then, does not an infusion of malt, which certainly contains sugar enough, enter into fermentation without the addition of yeast (or a ferment)?" I think we can only answer this question by stating that it, in all probability, arises from the *vitality of malt having been completely extinguished, by the heat to which it has been exposed, before infusion.*† Such infusion is, consequently, reduced to the condition of a mere infusion of sugar, in which we know that the addition of yeast is necessary to cause fermentation. I have little doubt that this view is the correct one, although so completely at variance with Liebig's opinions generally on this subject.‡

As promised, some pages back, I now return to the properties of air which has been exposed to the action of potass.

A very accurately-ground glass stoppered bottle was filled about one-fourth part with a strong solution of potass, which was agitated occasionally during three days and nights, care being taken during that period not to remove the stopper. A fly, enclosed in fine gauze, was now quickly introduced, and the stopper again inserted. The fly was thus confined in the air above the solution of potass, and left there during twenty-one hours; at which period it was taken out, quite as lively as when first put in.

It follows from this experiment that long contact with a strong solution of potass does not seem to render the air less capable of supporting animal life; hence, probably, does not alter the common chemical affinities of the air, a change that would appear, from Saussure's experiment, very probably to be produced by its exposure to a red heat. Indeed, we observe so frequently that this degree of heat does change or modify ordinary chemical affinities, that we can scarcely doubt that it might tend to prevent the appearance of *infusoria* by such change, just as well as by actually destroying any ova the air might contain, which effect it will of course have.

Now, long exposure to potass was not so likely to change the ordinary affinities of air as exposure to a red heat; and as a fly can live in such air, it seems clear that its affinities are not materially changed, or the insect would have been killed by it.

This experiment, then, seems to afford additional evidence in favour of the truth of Spallanzani's doctrine (the *omne ab ovo*) in preference to that of Aristotle, or of equivocal generation. But although taken in conjunction with those of Schultz and Ure, above alluded to, it may be said to remove, perhaps, the chief ground for supporting the Aristotelian doctrine, still it does not appear less clear, from what has been said, that fermentation and putrefaction are still *quasi* vital processes, and that Liebig has not succeeded in referring them to the more general principles of inorganic action further, indeed, than life itself can be referred to such principles. However ingenious the analogies he has attempted to point out, such analogies are very far from complete.

Indeed, if we look to final causes, we shall find reason for believing that fermentation and putrefaction should be removed from the domain of purely inorganic actions, as much as life itself is so; since without them vitality could hardly be supported, they being almost necessary to the development of many forms of insect and vegetable life.

Anxious to give the fairest play to Aristotle's doctrine, and observing it stated that if the interior of a sound potato were cut out, and placed in a good glass stoppered bottle a long time, that some forms of animalcular or insect life would appear, I continued such experiment many months; yet the potato only slightly blackened, and certainly no forms of life visible to the unas-

* "Traité," vol. vi. p. 401.

† Not only is the barley exposed to great heat during "malting," but the infusion of malt itself is *boiled* in order to convert a greater proportion of the starch into sugar.—(Berzelius passim.)

‡ On this view *any* cold vegetable infusion, to which sugar is added in sufficient quantity, should ferment spontaneously. Barley for instance. However, as Berzelius states that if the quantity of sugar is too great, fermentation is likewise prevented, as by too high or too low a temperature (Op. cit. p. 401), care must be taken in this respect. This *excess of sugar* preventing the action, seems at first sight one of the strongest arguments on Liebig's side of the question, yet not noticed by him. For, on the principle of vitality, we can understand it may be said how *poisons* should stop fermentation, but not how sugar in excess can so act. To this we reply, that a strong solution of sugar has, like the poisons bichloride of mercury and arsenic and others, a strong antiseptic power, as is shown by the preservation of ginger, fruits, &c., in syrup. It therefore has a tendency in *such excess* either to prevent vegetable matters absorbing oxygen and giving out carbonic acid gas, or some sort of chemical change indispensable to fermentation. A strong solution of sugar has clearly itself no tendency to change or to absorb oxygen, I having kept such for eight weeks—many hours, too, in the sun at a heat of 90°—without change, though not near so strong as to constitute a syrup. It still tasted sweet as at first. Perhaps, when of this strength, it also acts mechanically, *in some degree*, in preventing vegetable decomposition. It is remarkable that sugar does not act at all like alkalies in removing acidity. I added so much sugar to a solution of citric acid to make it taste very sweet, yet litmus paper was still immediately reddened by it.

sisted sight made their appearance. I consider the vegetable matter to have been actually preserved from more than a *very* slight and *external* change, by the *confined* air in which it was placed being probably changed to carbonic acid gas, which in Ayre's experiments, above alluded to, prevented, at all events, the putrefaction of animal matters.

According to De Saussure, grape juice in contact with oxygen gas did not ferment, while in the same proportion in contact with air it did. (Liebig, op. cit. page 221.) This singular fact wants further elucidation, viz., whether the same result obtains when the oxygen gas is derived from different sources; that is, whether fermentation cannot take place in oxygen gas, or whether it depends only on the degree of heat to which the oxygen has been previously exposed. In reference to this point, the reader will not forget that *oxygen gas does not support life, except for a very limited period.* So that, if obtained in the same way, it should not on our theory support fermentation. We have here, then, an additional argument in favour of the similarity of both these actions, and another against Liebig's views.

In addition to its having usually been subjected to a red heat, there is still another possible way by which oxygen may be rendered incapable of supporting fermentation. I allude to its not holding mixed with it (like air) a *certain amount* of carbonic acid gas, or perhaps, indeed, of nitrogen; since, according to late experiments, this seems actually absorbed *with the oxygen* in the processes of respiration. But since when we add nitrogen as well as carbonic acid gas to oxygen, we in fact make a mixture similar in ingredients to air; the experiment should first be tried of adding the usual amount of carbonic acid gas in air to oxygen (procured at a low heat). If fermentation does not take place in such a mixture, a small proportion of nitrogen may be added; but less than that existing in air. And these reflections with regard to the *possible* utility of a small proportion of carbonic acid gas in air to excite fermentation, leads me, in justice to the supporters of *equivocal generation*, to state, that until this point is accurately determined, we do not seem justified in pronouncing with so much certainty against them as I had presumed before this experiment (*to be desired*) occurred to me. And certainly analogical reasoning would lead us to believe that it is a point of importance, since we know, from late experiments, that a certain amount of carbonic acid gas in the air seems essential to the existence of *vegetable* life, the solar light giving the *plant* the power of decomposing this gas, *and appropriating its carbon as food*. The experiment already stated, in which the fly lived a long while in air deprived of carbonic acid gas, would induce us to infer that a *small* proportion of carbonic acid in the air is not necessary to *animal* life, particularly as we know that a *great excess of it* is deleterious, or actually poisonous, according to the proportion. But the process of fermentation seems more allied to the nature of vegetable than of animal life.

(*To be concluded in our next.*)

THE INVENTION OF GROOVED ROLLERS FOR THE MANUFACTURE OF BAR IRON.

BY DAVID MUSHET, ESQ.

"If Mr. Cort's very ingenious and meritorious improvements in making and working iron, *and his invention of rolling bar iron*, and the great improvements of the steam-engine by Watt and Boulton, should all succeed, the expense may be reduced so greatly, that British iron may be afforded as cheap as foreign, even if the latter should be allowed to enter duty free, perhaps cheaper, and of as an improved a quality, and in quantity equal to the demand, then it is not asserting too much to say that that event would be *more advantageous to Great Britain* than thirteen colonies; it *would give the complete command of the iron trade to this country*, with all its vast advantages to navigation."—"*Observations on the Commerce of the United States.*" *By the Earl of Sheffield*, 1786.

[Frequent appeals have recently been made to the public on behalf of surviving relatives of eminent men, of which the most conspicuous was a paper which appeared a few weeks since in the *Times*, evidently written by Mr. Carlyle, and bearing the names of nearly a score of the most distinguished writers of the present day. This document solicited subscriptions in the interest of two maiden ladies, remotely related to Dr. Johnson. Without questioning the propriety of such a proceeding, under the circumstances of that case, we do not hesitate to say, that in the following article, Mr. Mushet (whose sources of information on the following subject are very trustworthy), brings to the notice of our readers events which render it certain that the case of Mr. Richard Cort and sisters, which is at present exciting considerable interest, is much more worthy of the careful attention and assistance of all, and especially of those interested in the iron (and collateral) manufactures and trades of this country. A general subscription has been commenced for the future support of the four surviving descendants (one son and three daughters), of the late Henry Cort; and an honorary committee has been formed for taking charge of the proceeds of the same, and applying them to a fund to be called, "Cort's National An-

[redacted]

nuity Fund." The committee is composed of the following gentlemen:—Rev. J. Booth, LL.D., F.R.S., Chairman of Council of Society of Arts; W. Chaplin, Esq., M.P.; Professor Solly, F.R.S.; J. Simpson, Esq., President of Institution of Civil Engineers; C. Manby, Esq., Secy. do.; Dr. W. Carpenter, F.R.S.; D. Mushet, Esq.; R. Hunt, Esq., F.R.S.; C. Sanderson, Esq., Sheffield; H. E. Hoole, Esq., Sheffield; C. Hood, Esq., F.R.S.; J. Page, Esq., C. I.; and E. Hopkins, Esq., C.E., F.G.S. Until the necessary arrangements are made by the committee, subscriptions will be received at the office of this *Magazine*.—Ed. M. M.]

In, or about the year 1714, Mr. Abraham Darby, of Coal Brook Dale, revived, after the lapse of nearly a century, the process of smelting iron with pit coal, patented by Dudley in 1619. The difficulties encountered through his political opinions as a royalist, his losses by that extraordinary church militant, who

> "Called fire and sword and desolation,
> A godly thorough reformation;"

the desperate opposition and destruction of his works by jealous rivals in the charcoal iron manufacture, are recorded in his "Metallum Martis," and form a well-known chapter in the dismal history of the inventors of great benefits to nations. As long as the woodlands of Sussex were able to supply charcoal for smelting the abundant ironstone of that county, Dudley's process slept, until growing necessities compelled the resort to pit coal for the manufacture. Our iron trade was dwindling to a shred of its former importance, and the successful efforts of Mr. Darby have entitled him to a high place in our economic records. The cast-iron so obtained was not found to yield a serviceable quality of malleable iron. The tedious and expensive process of malleableizing by the charcoal hollow fire, remained, for the most part, confined to the charcoal blast-furnace districts. On these we were dependent for the supply of ordinary internal consumption; for anchors, and all important requirements of quality, we were at the mercy of Sweden and of Russia, then rising into a great iron-producing state, from the works established by the indomitable energies of that panto-technicist, Peter the Great. But as a compensation, our pit coal pig-iron was found of a very superior quality for castings, more fusible and more homogeneous than the charcoal iron. Cast iron assumed a new importance. The first iron bridge cast at Coalbrook Dale, is a land mark on engineering history. As these works progressed, their success excited numerous competitors. Amongst others, the celebrated Carron works were founded, and the exquisite qualities for fine castings which distinguish the Scotch iron were first developed. About the year 1755, Mr. Anthony Bacon, a man of vast capacity and foresight, pierced the shadow of coming events, and obtained for the trifling rent of 200*l.* per annum, a lease of the minerals under forty square miles of moor and mountain, surrounding the then insignificant hamlet of Merthyr Tydvil, where he erected works for the manufacture of the new pig iron. He made roads through the waste, studded the valleys with mansions, in one of which now resides the frank and hospitable Mr. Crawshay Bailey, M.P., a house then buried in a sequestered nook, seven miles from the seat of operations at Merthyr Tydvil, now blackened with the smoke of the later works of Aberaman and Aberdare. The pit coal cast iron was found excellent for cannon. Mr. Bacon amassed a large fortune by contracts with the government, and in 1784, satisfied with wealth, he retired; a trait of wisdom not often met with in these hungry neck-or-nothing days of empty ostentation. He sublet his mineral tract in four divisions, now occupied by the Dowlais, the Penydanan, the Cyfarthfa, and the Plymouth works, north, east, west, south of Merthyr Tydvil. Mr. Richard Crawshay was the lessee of the Cyfarthfa flitch of the great Bacon domain. The story of his life has often been told as an instructive lesson of keen perseverance,—honourably rising from errand boy at an ironmonger's to be proprietor of the shop, and thence sallying forth to the wilds of Cwmry to make the goods which he before sold. There were at that time, as I have stated, no means devised for malleableizing the pit coal cast iron with economy or excellence. A modification of the charcoal refinery, or hollow fire, was worked with coke, as a substitute for charcoal, but the bar iron hammered from the produce was very inferior. It is stated in a letter by Mr. Robert Thompson (uncle of the late Alderman Thompson), that Mr. Crawshay, in his new undertaking, manufactured with difficulty ten tons weekly of this common iron, upon premises which can now supply easily 1,000 tons in the same time, of the finest quality, through the invention of the puddling furnace and the grooved roller. The large competition which had sprung up throughout the kingdom in the production of cast iron, rendered this a far less lucrative pursuit, than during the comparative monopoly of Mr. Bacon's thirty years. The distance and cost of land carriage from Merthyr to Cardiff was great; and many are the records left by Mr. Crawshay of his anxieties and uncertainties in hammering out his little mite of common iron. As I

have already stated, the navy, and all important works, depended upon Sweden and Russia. In the year 1784, 75,000 tons of charcoal bar iron were imported from those countries at an average cost of 35*l.* per ton! Great Britain, then as little as she is now the reverse in iron making, made for *herself* 17,500 tons of charcoal iron yearly; in 1854, she exported, after supplying *herself* with two million tons, 1,470,723 tons of pit coal iron, for *foreign nations*. In 1784, and until 1789, Mr. Crawshay, at the great Cyfarthfa works, elaborated, by close perseverance, his ten tons of common bars per week; his house, closely adjoining the works, vibrated to the repercussions of the forge hammer, and he counted his gains at a penny a stroke.

In the year 1740 was born at Lancaster Mr. Henry Cort. He became established as an iron merchant at Gosport, in Hampshire, and his remarkable intelligence grasped the idea of rendering his native country independent of foreign sources for its supply of iron. He expended a fortune of 20,000*l.* in experimenting, and for the purpose erected works at Fontley, near Gosport, persevering with that tenacious faith which is the birthright, and too often the only inheritance, of the true inventor. His views were discouraged and discountenanced. There is an admirable letter in existence from Mr. Alexander Raby, one of the highest characters in the British iron trade of the last century, stating his total infidelity of Mr. Cort's success before he accomplished his task, and with manly candour avowing equally the inventor's complete triumph over his adverse predictions. Having completed his object, Mr. Cort, in 1783, specified his first patent for malleableizing cast iron in an air furnace, by the cheap flame of pit coal, "without charcoal, blast, bellows, or cylinder;" and in 1784, his second patent for the grooved or fluted roller, a logical supplement to the first invention, by means of which the large masses of iron at a welding heat, so readily obtained from the puddling furnace, were, in an instant of time, elongated into bars, instead of the tedious and imperfect previous operation of shaping a rough mass into a square and lengthened figure, by incessant blows of a hammer. In the next year, forty-eight trials of the iron produced from common ship ballast, the worst quality of cast iron, under these patents, were made at the Royal Dockyards, superintended by the celebrated Professor Black, of Edinburgh, and conducted by the master smiths of each dockyard. The result of experiment proved the new iron to be superior, for the largest anchors and other naval purposes, to the Swedish Oreground iron, the best mark imported. The navy, from that date, contracted for no iron without a certificate, "that it was made by Cort's process," and from that date the import of foreign iron has dwindled from 75,000 tons to a few hundreds, for choice purposes of steel making. From dependent importers, we are metamorphosed into vast exporters, to every market of the world. The very workmen of the dockyards had a plain common sense perception that it was a grand achievement to make Old England her own purveyor of iron, and in enthusiasm they carried the conqueror in a triumphal procession. Had these inventions been made in barbarous Russia, their author would have been covered with the highest dignities and decorations the empire could bestow, and granted territories of more extent than our whole island; moral, religious, and independent England, the apostle of justice and freedom, made haste to recompense him with the little domain six feet by two.

Mr. Richard Crawshay, tediously forging his ten tons per week in the Welsh deserts, was too shrewd a character not to appreciate so great a work, and the appearance of a rival in the market. In 1787, he visited "the little mill at Fontley," as he terms it in a letter to Lord Sheffield's secretary; he forthwith engaged with Mr. Cort for the erection of puddling furnaces and grooved rollers at Cyfarthfa. Under Mr. Cort's superintendance, these were accordingly completed by Mr. James Cockshutt, Mr. Crawshay's partner, residing at Cyfarthfa. Mr. Samuel Homfray, at the neighbouring works at Penydanan, was equally alive to the great inventions. The Cyfarthfa new mill (as related by Mr. R. Thompson), turned out 200 tons weekly of excellent bars, with the *same labour* previously engaged in pottering and stamping out with the hammer, the (to our present ideas) burlesque amount of ten weekly, and weakly, tons. Mr. Homfray, as related in a letter from Mr. Cockshutt, borrowed of him the drawings of the puddling furnaces, the patterns of the rolls, and Mr. Cort's workmen to teach the operations; and contracts were signed to pay Mr. Cort ten shillings per ton of bar iron, as the license dues for his two patents.

The erection of these, at that time collossal works, occupied a long period, during which, from 1785 to 1789, Mr. Cort, with whom the Government had made contracts, carried on "his little mill at Fontley." Some time previously, having expended the whole of his private fortune in erecting and completing his works, and experimenting on such a costly subject as a new process of ironmaking, he took into partnership Adam Jellicoe, chief clerk in the office of the Pay-

master of the Navy. This gentleman was reputed of honour and of wealth, and he made the bargain of a man of wealth. He advanced Mr. Cort, from time to time, £27,500, to receive for it 5 per cent. interest, as if a loan, half the profits of his trade and patents, and a salaried appointment for his son at the works. In 1789, Mr. Jellicoe suddenly died; and, to the general astonishment, he was found to be a public defaulter; this £27,500, as appears upon the affidavit of Mr. Alexander Trotter, the Paymaster of the Navy, being monies entrusted to his deputy for the discharge of the wages of the seamen and officers of His Majesty's Navy. I know nothing of the routine of public offices, to enable me to state in what way the deputy paymaster could keep the seamen and officers without their wages for seven years, unknown to his principal; but so it was. Adam Jellicoe died, and his accounts exhibited the deficit; but his deceived partner, Mr. Cort, stood in a high position. He was engaged on lucrative contracts for the Navy. The Cyfarthfa and the Penydanan Mills were approaching completion, other iron-masters had made and signed similar contracts with the patentee, and very large returns from the patents were certain. The Cyfarthfa royalties alone, upon 200 tons weekly, would amount to £5,000 a year; and the whole quantity which was actually made subject to these contracts, and the general patent rights, from 1789 to 1800, when the patents expired, make up royalties at only 7*s.* 6*d.* per ton, to the amount of £187,000. Two or three years' income of the licenses would, therefore, have entirely cleared Mr. Jellicoe's defalcations, and one would have conceived that the Government of a country which Mr. Cort had so signally served, would have hastened to take the security of his licence dues, in repayment of his partner's default. A very different course, for some reason or other, was adopted. Mr. Alexander Trotter, the Paymaster, sued out the Star Chamber process of an extent in aid against Mr. Cort's effects, upon an affidavit, in which he swears *that he is informed* that Mr. Cort's prospects and credit are *much decayed* (Mr. R. Crawshay's contract to wit), requiring this summary process to prevent *total loss* of the default. Under this iniquitous step, a destructive sale of his premises at Fontley was made by the Sheriff of Hampshire, producing, with his stock and effects, over £16,000. The goodwill of his premises would have realized, by the jury's valuation, nearly £20,000 more, leaving an excess over the default, and the *patents in the hands of the proprietor. But this was not done.* A debt of £11,000 was unnecessarily *kept in hand*, and for this deficiency the patents and contracts were seized and locked up in the desk of the Solicitor to the Navy Board. No attempt was made to claim the dues accruing from the respective iron-masters for using the patents; and though the public advertisements for Naval and Government stores required a certificate that the iron to be supplied was manufactured "by Cort and Jellicoe's process," the documents lay like waste paper in the den of the limb of the law. Mr. Crawshay and Mr. Homfray never paid a shilling; the extent *in aid* was *just in time.* The Glamorganshire Canal was rapidly constructed out of the profits of Cort's inventions in the year 1798; it was completed; and by 1800, a quantity of iron of his make had passed down that canal, or reached the market by other channels, evading his rights to the extent of £200,000. Year by year was witnessed and recorded in the daily newspapers, the diminution of foreign import, and the extension, at the rate of 30,000 tons a year, of British iron to markets it had never seen. Little knowing what Cort had effected, the mad and hapless Paul of Russia thought to ruin and cripple our resources by cutting off *his supply* of iron, of which we had already become independent. But the author of these great things remained neglected. I never heard that Mr. Crawshay or Mr. Homfray made any effort to redeem his patents from their legal illegal guardian, nor can I say to what Mr. Trotter's extraordinary apathy was to be attributed. Mr. Cort continually pointed out to him the increasing results of his inventions, but in vain. At length, as a miserable substitute for justice, he received a charity.

(To be continued.)

WINCHESTER'S INSTRUMENT FOR THE TREATMENT OF FRACTURES.

(Patent dated November 24, 1852.)

In 1853 we directed attention to an improved splint, patented by W. H. Winchester, Esq., F.R.C.S., Surgeon to the Westbourne Dispensary, and, judging from the evident adaptation of it to the purpose for which it was designed, ventured to pronounce it a very valuable instrument. As subsequent experience has amply confirmed our opinion, and as the war has given great importance to every invention which aids the practice of the surgeon, and alleviates the sufferings of the wounded, we again bring the improved instrument before our readers, selecting for illustration a somewhat modified form of the arrangement represented in our former article.

The improvement which constitutes Mr. Winchester's invention consists in applying

a method of adjustment to Listón's double-inclined plane, which, under various forms, is well known in the profession. The advantages it possesses are—1st. The power of adjustment to the natural curve of the limb, by which exact co-aptation is preserved. 2nd. The entire prevention of displacement by the application of a swing to the foot-piece, which, although simple, is nevertheless most efficient, enabling the splint to move with the limb, whatever its motion, whereby the comfort of the patient is materially increased. In addition to these, a portion of it, fig. 3, can be used as a stump-rest.

The instrument, it will be seen, consists

Fig. 1.

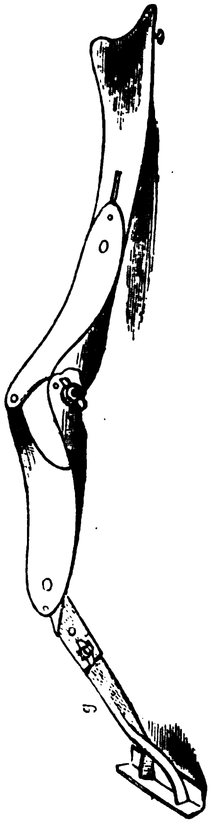


Fig. 2.

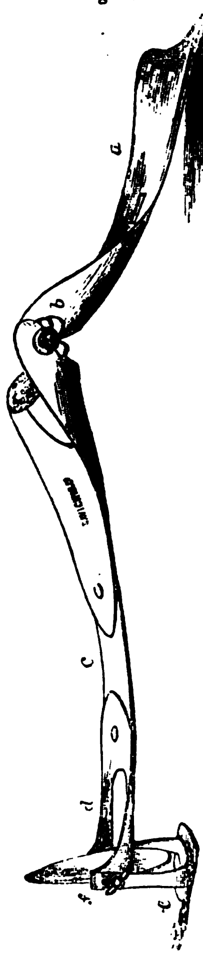


Fig. 3.

of five pieces: *a*, thigh; *b*, knee; *c*, leg; *d*, footpiece; *e*, swing; *f*, rack for regulating the angle of the footboard; *g* is the support for the stump-rest; *h h h*, points or indices; *f f f*, central line; *k*, screws for regulating length and adjustment. Its application is as follows:—Apply it to the sound limb, and having fixed the knee and footpieces at the desired angle, regulate the length and adjust to the natural curve by giving the necessary lateral movement, so that the limb may rest in its entire length exactly in the

centre of the splint. Having fixed it in this position by means of the screws underneath, remove it from the limb, and observing the indices, mark their deviation from the central line, and, by slightly loosening the screws, turn them to similar points on the opposite side, so that the natural curve of the injured limb may be thereby obtained; or, if preferred, as more in accordance with the ordinary method of procedure, the length may be regulated by admeasurement, and such lateral motion given as is necessary to preserve perfect co-aptation.*

As we have above intimated, this instrument has been found in hospital practice to fully answer its object in every respect. As an example of the important testimony that has been borne to its merits, we may mention that Mr. De Morgan, an eminent and experienced surgeon, writes to say that he has used the double-inclined adjustable splint in five cases of fracture in the Middlesex Hospital; four of fracture of the tibia, and one of fracture of the lower end of the femur, extending into the joint. The fractures of the tibia were all oblique, and in three "there was," he says, "a strong tendency to displacement until they were placed on the splint, after which they gave no further trouble. The last case in which it was used by me in the hospital," he continues, "will serve as an illustration of the advantage of attending to the principle carried out by the inventor in the mode of adjusting the apparatus. It was that of a soldier in the Light Dragoons, who had fractured the tibia obliquely at its lower third. The limb had been placed in good position on a Macintyre's splint; but when I saw the patient two hours afterwards, the bone was displaced, the lower portion being drawn upwards and inwards. It seemed a good case for testing the improved splint, and on adjusting it to the sound limb, we found that a considerable inclination of the lower joint of the splint inwards was necessary in order to fit it properly to the natural curve of the leg. An equal inclination was then given in the opposite direction, so as to fit it for adjustment to the fractured limb; and on now placing the leg in it, and putting the fractured ends of the bone in apposition, they remained in place; nor was it found necessary to interfere further until union had taken place, at the end of four weeks, when the limb was found to be quite strong, and without the slightest irregularity in form or length. Yet during the time he was on the splint the man changed his position easily and frequently. This he was enabled to do in consequence of the contrivance of a moveable rest at the lower end of the splint, which seems to me to answer even better than the suspending apparatus usually employed.

"This is the history of the other cases in which I have used the splint, and in all the patients have found great comfort from its application. In one case I was obliged to remove it from a patient who had been using it for some time, and where there was no longer any risk of the displacement of the bones, in order to apply it in a recent case. The patient from whom it had been removed, and whose limb was placed on an ordinary Macintyre's splint, said that he had found very far greater ease in using the new apparatus.

"It cannot, I think, admit of doubt that the adjustment of the splint to the natural curves of the bone is greatly calculated to ensure a good result. This is easily and effectually done with Mr. Winchester's splints, but can be effected only with difficulty, if at all, with any other with which I am acquainted. Indeed, I am not aware that the attempt had been made, or that the principle had been recognized, before the invention of the adjusting long splint. The moveable rest is hardly less useful, as it allows the patient to move and shift his position without risk of displacement of the fractured bones.

"I have not found anything to object to, nor can I suggest any improvement in the splint."

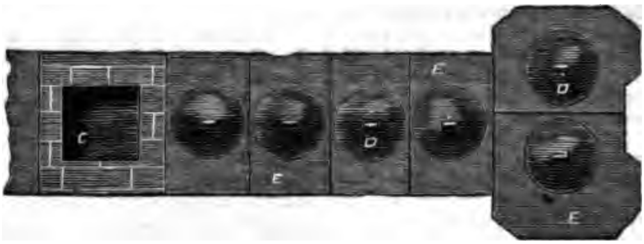
The advantages of such an apparatus as that under notice will, we are confident, be so far and so readily comprehended by our readers as to excite in them an earnest desire for its general and speedy adoption, both in our home hospitals and in those of our army in the east.

CAPTAIN GRANT'S COOKING-APPARATUS FOR TROOPS, ETC.

A very useful and economical arrangement of cooking-apparatus, the invention of Captain Grant, has been introduced, and is now in full operation at the Aldershot Camp, having been approved and adopted by the Government. The accompanying engravings represent a sectional elevation and plan of the apparatus employed, which comprises a long horizontal flue, B, opening at the middle of its length into a chimney, C (one half only of the flue, B, being shown in the engraving, as the parts on each side of the chimney are exactly similar.) This horizontal flue, B, is built strongly of brickwork, and is covered with transverse iron plates, E, turned down at their ends so as to clasp the exterior of the brickwork. At each

* The instrument may be procured of Messrs. Savigny, St. James's-street, London. Price 30s.

end of the flue a fire-place, A, of fire-brick and fire-clay, is built, the door, F, of which is furnished with vertical openings for the admission of air, and with a slide for shutting off the air when necessary. The fire is also supplied with air from below, which creates so powerful a draught that any description of fuel will burn well. The iron covering



plates, E, have formed in them holes to receive cooking kettles or saucepans, D, which descend some distance into the flue, so that the heated gases play round a large extent of their surfaces.

Very great care and scientific skill has been shown by Captain Grant in so arranging the parts as to provide for all the circumstances to which the action of the heat is likely to give rise, such as the expansion of the metals, &c. Thus the fire-doors, F, are made slightly narrower than the space between the brickwork enclosing them, the doors being fixed in their positions by means of studs below and above taking respectively into recesses in mortise-bars, G, which sustain the doors, and into the covering plates, E, which are over them. The intensity of the fires is regulated by means of balanced dampers suspended over pulleys placed one against each side of the chimney. These dampers are somewhat narrower than the flues, so that the draught may never, by mismanagement, be wholly stopped; and, being balanced, may be raised or lowered as occasion requires. The saucepans, D, are fitted with handles, placed so as not to get heated, and with moveable chambers for steaming, &c. Means are provided for removing the chimney of an ordinary camp cooking-apparatus of this description, and for placing in its stead another having space in it to receive a large portable oven for baking. In this arrangement the flues are arranged so as to bring the heated gases into close and continuous contact with the oven, and the flue above is contracted towards its lower part in order to prolong the time during which this contact continues, and thus to abstract as much of the heat as possible from the gases before they pass off.

The saving in fuel effected by the employment of this invention is very considerable. At the Aldershot Camp, where the cooking houses are all on this plan, the food for thirty thousand men is prepared with a consumption of coal amounting only to half-a-pound per day for each man, the cost being one-halfpenny per man a week.

As this system of cooking is likely to be extensively used in large private establishments, it may be well to state that it is important that the brick-work in the fire-places and flues should be well constructed; the former should be carefully built with fire-brick and fire-clay, and the latter laid correctly and level, in order that the iron plates which cover the work may have a true and equal bearing, for where this is neglected, the operation of cooking is not only materially impeded, but the intense heat of the fires soon deranges the imperfect brick-work. Before the fires are lighted all the ventilators should be opened, and the dampers raised. Those of the kettles or saucepans which are nearest the fires will, if the latter be properly lighted, boil in about half-an-hour from the time of lighting them; those farthest from the fires should then exchange places with

these, the ventilators being at the same time closed and the dampers lowered, by which means the draft will be checked, and the whole of the vessels kept simmering until the cooking is completed.

ON THE ESTABLISHMENT OF CHEAP (PENNY) GYMNASIA.*

BY DR. J. LOTSKY.

[THE following paper upon a subject which deserves the attention of patriots as well as of philanthropists, is written by a gentleman who nobly devotes the time which, as an exile from his native land, he has at his disposal, to undertakings that he considers calculated to improve the condition of the society in which he resides. We have thought it better to present it to our readers as it appears in the author's manuscript, than to adapt it accurately to the idioms of our own language.—ED. M. M.]

The present sanitary condition of the humbler classes of society cannot be much dilated upon on this occasion. Suffice it to say, that there are two opinions now prevalent in this respect. One party says that medical science has *improved* the sanitary condition of mankind—that the average duration of human life in Europe is greater—that the scale of mortality is less than before, &c. I am of a diametrically opposite opinion. I contend that medical science has not attended hitherto to the *health*, but merely to the cure (*maladies*) of men. My opinion is based on the scores of hospitals, which are yearly established all over Europe; the millions of *cases* of which they boast; and the horrible operations which our surgeons have almost daily to perform. I base my opinion on the sturdy, hardy appearance of the inhabitants of some rural out-of-the-way district, and the emaciated, sickly, broken-down aspect of most of our working men in the large towns. My opinion is further corroborated by the frightful increase of insanity and criminality, in which respect the science of statistics is defective, as I am convinced that most of our maniacs and criminals are *not* strong, hale, hardy, good-looking people, but mostly consist of those puny pigmies, without soul and entrails, which our age is chiefly made of. But, to repeat, the discussion of this topic would be misplaced here, and I may put my readers to the test by saying, let every one answer for themselves, whether they, as in times of old, rise with the rising sun, go cheerfully to their work, eat with a hearty appetite, are always cheerful and contented themselves, are able to pass over hill and dale in every season and every weather; or, on the contrary, whether they lead a life wrapped up in flannel, and sneak out of bed as late as possible, dejected rather than refreshed, their daily work being a daily burthen to them. And then comes all sorts of cures and patches, the surgeon's steel, a long bed of sickness, &c. It strikes me, however, that the emigration to California, Australia, and the United States, has completely unshifted the condition of our working population, our labour market, and everything connected with it; there is no deficiency of work but of working men now, and if we can make the generality of people able to work, *i.e.*, if we can make them hale and hearty, the greater part of the social problem would have been solved.

The origin of *gymnastics*—bodily exercise and games—is hidden, like other social radii, within the dim of nascent history. But it is highly characteristic, that at a time when all people were either warriors, huntsmen, agriculturists, or artizans, &c., that at such a period men should have added to these compulsory bodily exertions, one *voluntary* and adventitious, unless its importance, in a bodily and ethical point of view, should have been strongly felt. Probably gymnastics, like other radii of social life, owe their introduction to the prescience and intuition of some man of genius. In fact, the intimate connection of bodily exercise and games with the religious rites of antiquity, and the point blank credence that some god (Apollo or Æsculapius) has invented them, fully corroborate my assertion. Another equally important fact is also less known. It appears from Plato, that the ancients considered the cure of *chronic* disease, if not altogether impious, at least inexpedient; and thought that to let those affected therewith die, was the greater mercy shown to them. It was the master of Hippocrates, Herodius of Silymbria, who first attempted the cure of chronic disease — by means of gymnastic exercise; a hint of great and wide importance. Who, of Englishmen, can ignore the festivals and games of ancient Greece, where beside the ranks of philosophers, historians, and orators, stood the athletæ and other pupils of gymnastic art—a scene so eminently depicted by James Barry on the walls of the Adelphi? But of more importance for our purpose, are the games and plays of the English in the middle ages, mentioned in several places by Stowe, and other writers of that epoch. Such were the cross-bow, for the practice

* The Great Health Movement. No. I. Strengthening of the Muscular and Co-ordinate Systems. Rationale and Rules of Muscular (gymnastic) Exercise.—*First publication of Metal Print.* Lewis, 15, Gower-street North.

of which there were extensive places in London, and in all other towns. Another game was the running at the quintain; and Stowe says that there was one in Cornhill, and another even on the ice of the Thames. Other exercises and games were the football, stilt-dancing, swinging, balancing, vaulting, bowling, quoits, cricket, &c. I am convinced, that there is half of the working people of London who hardly know the half of these games even by name. It is hardly to be believed, that perhaps half a million of people go in this metropolis from their daily work to their resting place, day by day, week by week, year by year, without ever seeing God's wide open nature, or enjoying any healthy, stirring, out-of-door exercise! It is erroneous to think that the occasional walks, longer or shorter, or even the *occasional* use of the hoop, or the skipping-rope, &c., will effect ought even for children. Here, as in any other serious pursuit of life, nought but a sturdy, persevering continuance of exercises, and a constant increase of these exercises, both in number and duration, as well as intensity, will be of any utility.

But where shall the people of these times find the space and occasion for such practice and recreation, as the Enclosure Act of cities has by long preceded that of the land? Where shall they acquire health, strength, cheerfulness, animation, freedom of mind and body? The answer is a plain but full negative. When, as Stowe informs us, the citizens of London practised the cross-bow exercise, there must have been ample room for so doing, adequate places for public exercise and recreation. It ook thirty years before public baths were established in London, although every small municipium of the Romans possessed them. As far as the latter are concerned, those are in error who think that the public baths are mere *ablutory* establishments for the humbler classes. In the baths of George's-street, Euston-square (the only well appointed in London), there is always one or two persons who take cold shower baths the whole year round, even in January. No one would do so unless he felt the necessity, or at least utility for so doing. Now, what baths will do in a sanitary point of view in a few cases, systematic muscular exercise (gymnastics) will do for whole populations—the nation at large. It is only required to prepare a sound, *honest*, practical plan; as it has been proved, over and over again, that public baths, lodging-houses, &c., can be made not only self-supporting, but remunerative, if some *honest* and practical men have the planning and conducting of them. If we consider that there are, say 100,000 people in London, employed on more or less insalubrious trades—as shoe-makers, tailors, &c.—in fact, all sedentary, room-confined trades; if we consider also that there is another 100,000 people pent up at their desks, their counters, &c.; if we consider, lastly, that there is 100,000 children, who merely walk from the school home, and from home schoolward, we obtain an approximative calculation to what numbers of people a systematic progressive muscular exercise (gymnastics) would be of the utmost importance.

(*To be continued.*)

A Treatise on Conic Sections: containing an Account of some of the most Modern Algebraic and Geometric Methods. By the Rev. Geo. Salmon, M.A., Fellow and Tutor, Trinity College, Dublin. Third Edition, revised and enlarged. London: Longman, Brown, Green, and Longmans.

This is at once the most philosophical and the most comprehensive treatise on conic sections, or plane co-ordinate geometry, which has fallen under our observation. It is very possible that students who, for the first time, are seeking an introduction to this subject, may find other works more suitable for their purpose, on account of the fuller detail and more simple arrangement in which the more elementary parts of the subject are presented to them. But to the mathematician who wishes to become complete master of the conic sections, Mr. Salmon's treatise is, in our opinion, indispensable. The author evidently had so much matter on hand connected with the more advanced modern methods, that he had no time to linger over the elements of the subject. The methods founded on the Cartesian system, although admirably given, and illustrated by numerous examples, do not form the prominent feature in the work. Especially we miss one most useful form of the equation to the straight line, of the value of which every one acquainted with the late lamented Professor O'Brien's treatise must be well aware. We mean the equations

$$\frac{x-h}{l}=\frac{y-k}{m}=r.$$

The determination of the areas intercepted by intersecting straight lines is so readily and elegantly given by help of these equations, and the properties of intersecting straight lines in the conic sections so immediately flow from their use, that we think their absence somewhat of a defect in Mr. Salmon's treatise. But really the excellencies of the work before us are so many and great, and the blot—if it be a blot—so trifling that we hardly like bringing it forward. The very fact, however, that we

can find no more serious fault in the earlier portions of Mr. Salmon's work may serve to illustrate its general excellence.

Our reader is probably aware that to the famous Descartes we owe the usual methods of co-ordinate geometry, by which problems in conic sections are solved by the reference of points to two intersecting straight lines as co-ordinate axes. Of late years methods, founded indeed in the first instance on the Cartesian system, but starting with certain results given by this method as principles, and adopting a different notation, have been extensively employed, and successfully applied to the solution of a large class of problems, which are almost without the range of the simple Cartesian methods. It is in the discussion and illustration of these methods, that Mr. Salmon's work is especially rich. It would have been desirable, perhaps, had Mr. Salmon, in his discussion of the abridged notation, entered somewhat more fully into the explanation of the way in which the angle (a), which the perpendicular makes with the axis of x, is to be measured. The length of the perpendicular from a point (xy) on the straight line, the perpendicular upon which from the origin is of length p, and is inclined to the axis of x, at the angle a is, $\pm(x \cos. a+y \sin a-p), \pm$ according as the point xy is on the opposite or same side of the straight line as the engine. In some cases there seems some ambiguity as to the fixed line from which a is measured; at least, language is occasionally used with respect to it which is not strictly correct. Mr. Salmon doubtless supposes his readers to be thoroughly conversant with the mode of measuring angles in trigonometry, and tacitly assumes that the same principles are to be applied to co-ordinate geometry, and has therefore probably thought it unnecessary to enlarge on this topic. In a fundamental matter of this kind, however, too much care cannot be taken to avoid ambiguity, and we hope that Mr. Salmon will remedy this defect in a fourth edition of his work.

In the work before us, not only are the methods of the abridged notation, and the other resources of modern geometry most ably unfolded and illustrated, but many beautiful and elegant theorems are given, for which we must refer our readers to the book itself. We do not anticipate that Mr. Salmon's volume will be very extensively used for the purposes of elementary instruction in the conics, but to the more advanced student it will be invaluable, and it will be an almost indispensable addition to the library of every lover of mathematical science.

TRIALS OF FIRE-ENGINES AT NEW YORK.

To the Editor of the Mechanics' Magazine.

Sir,—Perceiving, in your Magazine of October 20th, an account of the trial of fire-engines, at the Paris Exhibition, I presume that a brief statement of the trial in this city, on the 24th of October, at the annual fair of the American Institute, will be of interest.

The regulations of the day allowed sixty men to engines of the first class, fifty to those of the second, and forty to third class engines, though on none of them could more than three-fourths of those numbers find place on the brakes at once. They were to play through $1\frac{1}{8}$ inch, 1 inch, and $\frac{7}{8}$ inch nozzles, for the respective classes. In forcing to a height, they played through 450 feet of riveted leather hose, having couplings at every 50 feet, of 3 inch bore; for distance on a level, through 150 feet, all of the engines using the same lines of hose in turn. The heights were ascertained by having a line of boards put up on the Latting Observatory, with figures painted at every two feet, and these boards were coated with *rotten-stone and size*, so that the points reached by the water were clearly seen. The supply of water was rather deficient, as the head in the Croton reservoir was low at the time, and the engines being worked within the Crystal Palace, it was necessarily brought to them through hose. This will account for some apparent discrepancies in the results.

The following is a summary, the distances being measured from the nozzle.

	Height.	Level.	
	feet.	feet.	in.
First Class.			
Engine 8, of Brooklyn	..110	..206	
„ 13 „	..104	..206	10
Second Class.			
„ 8, of New York	80	..164	6
„ 29, „	86	..158	4
„ 11, „	90	..149	3
Third Class.			
„ 28, of New York	84	..189	6
„ 45, „	80	..169	6

You may be aware that our fire department is a voluntary organization, the members being exempt from military or jury duty while serving, and from *all* of these duties after five years of service. You will readily believe, therefore, that since emulation runs high among them, the builders of the engines had no cause to complain that they were inefficiently worked.

Two of our largest city engines, No. 38, and the "Exempt," were not entered for this trial, it being deemed inexpedient to withdraw them from service during the ex-

hibition. The latter of these has two 10 inch cylinders of 10 inch stroke, and manned by forty-four men, has thrown to a distance of 240 feet from a 1¼ inch nozzle.

I am, Sir, yours, &c.,
S. H. MAYNARD.

5, Wall-street, New York.

P.S.—Since writing the above, I have seen an account of this trial in the *Scientific* (?) *American*, and could not resist a smile at the "sell" which has evidently been perpetrated on their reporter by some waggish fireman, especially as to the length of hose and the size of nozzle used.

BOYDELL'S TRACTION ENGINE.

To the Editor of the Mechanics' Magazine.

SIR,—I hope you will admit the following from me, which is necessary to set myself right with Mr. Amos and your readers.

(1). In my last (page 493), I stated I was not at Carlisle. I have now to say, that I never saw the model made and exhibited there by Mr. Amos, and in giving the sketch, fig. 4 (page 417), was not aware that it bore any resemblance to it. On the contrary, fig. 5, in my second letter (page 470), which he could not have seen when he wrote his letter of the 15th ult., was intended to represent the model, because drawn by himself on my note book. When he states, that "your remarks upon the letter of 'W. B.,' No. 1682, page 417, so completely exhaust the subject," he obviously overlooks the fact that your equations, 5, 6, 7, 8, and 9 have not reference to his model or fig. 4, but in principle to fig. 5, and therefore that they do not prove his proposition. The fact is, his model proves nothing at all, not being applicable to the dispute in question between him and Mr. Boydell, as you were doubtless aware when you wrote the editorial note to my second letter, recommending "well-conducted experiments in the field (and not models)."

(2). Mr. Amos, I readily acknowledge, is one of the engineers alluded to by me (page 416), and as a member of the Royal Agricultural Society, I repeat without fear of contradiction, that if he is allowed to settle disputes by means of models foreign from the question at issue, the Implement Department of our Summer Meetings will soon become beautifully less.

(3). With regard to experiments, two kinds are wanted, and we hope the Board of Ordnance will settle both satisfactorily very soon. The first is, with a weight over a pulley to test the extreme draught of the engine; the second with the dynamometer, to test how much of this can be brought to bear upon the rail or road cartage. In the field, for example, the mean draught is one between two extremes, so that if the engine draws 4,000 lbs. over a pulley, then both these extremes must fall within this.

Adhering to what I have formerly said,
I am, Sir, yours, &c.,
W. B.

London, Dec. 3, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—I have read with some astonishment Mr. Boydell's remarks as to what took place at the Royal Agricultural Society's Meeting at Carlisle, relative to his traction engine. I believe he himself is the only individual who remained unconvinced, after the experiments with the model mentioned by Mr. Amos in your last Number. I think the value of Mr. Boydell's engine must rest upon other merits than the supposed mechanical advantage derived from placing the pinion either on the top or bottom of the spur-wheel. That the endless railway might be made very serviceable if applied to carts, or even a portable steam engine where the roads are bad, as they are in many parts of the country, I think there is little doubt; but as far as ploughing is concerned, I think with many others who witnessed the attempt, that it proved a total failure at Carlisle. Whether the difficulties they had then to contend with may ultimately be overcome, is altogether another matter, and one upon which a variety of opinions are entertained. At all events, I think some merit is due to Mr. Boydell for having made a step in the right direction.

I am, Sir, yours, &c.,
JOHN PINCHBECK.

Katesgrove Iron Works,
Reading, Dec. 2, 1855.

"IT IS THE SYSTEM."

To the Editor of the Mechanics' Magazine.

SIR,—I shall feel obliged if you will give a place to the following statement:—Immediately after Colonel Chesney, R. A., gave his lecture on fire-arms, at the Cork National Exhibition, in 1852, Colonel Beamish wrote a petition for me, which, at his request, the Duke of Cambridge presented to the Queen; her Majesty handed it over to Lord Hardinge, Master-General of the Ordnance, and on his Lordship becoming Commander-in-Chief, he handed it over to Lord Raglan, just appointed Master General. I have not heard any thing of it from that day to this, and must therefore infer that his Lordship was *instigated* by the "system."

I am, Sir, yours, &c.,
J. NORTON.

Rosherville Hotel, Gravesend,
Nov. 28.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

FRANKLAND, EDWARD, of Owen's College, Manchester, Lancaster. *Improvements in the treatment of certain salts, commonly called alums, to obtain products therefrom.* Patent dated April 25, 1855. (No. 938.)

Claim.—"The separation of the aluminous constituent from the alkaline constituent of completely or partially manufactured alums, by the application of ammonia or carbonate of ammonia, or of a caustic or carbonated alkali, so as to conserve and utilise the alkaline constituent of such alums."

SILVESTER, JOHN, of Smethwick, Stafford, engineer. *Improvements in spring balances, and in their connection and adjustment to steam valves.* Patent dated April 25, 1855. (No. 941.)

This invention consists in the application to spring balances used in the safety valves of steam boilers of certain mechanical appliances intended to insure a very delicate action of the valves, and to admit of a regular and easy discharge of steam immediately on the pressure exceeding the point to which the balance is adjusted, and to any amount without increase of pressure, whilst by the same means any tampering with the valves is also to be prevented. We shall probably publish a description of it shortly.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in apparatus for preventing the escape of fluids, which he calls diaphragm obturator.* (A communication.) Patent dated April 26, 1855. (No. 944.)

This invention consists in the application to pipes for conveying gas water or any other liquid of a diaphragm or slide working between two guide-plates suitably packed in lieu of stop-cocks.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *A new combination of slide-valves and ports for the induction and eduction of steam or other elastic fluids in steam engines or other engines of similar character.* (A communication.) Patent dated April 26, 1855. (No 945.)

This invention consists in the employment, in combination with the usual slide-valve, of a supplemental slide-valve, constructed and worked so as to move over a separate series of ports communicating with the same passages as the ports over which the usual slide-valve works, for the purpose of allowing a free exhaust until the end of the stroke of the piston.

SHEARS, WILLIAM, of Bankside, Southwark. *An improvement in cases or magazines for gunpowder or other explosive preparations or compounds.* Patent dated April 26, 1855. (No. 946.)

This invention consists in "the application of bands or straps of harder or stronger metal than the cases or magazines are composed of when such cases or magazines are each made with six equal sides, and of metal, tin, or tin alloyed. For this purpose I prefer," says the inventor, "bands or straps of copper or brass coated with tin."

BURLEY, THOMAS HALEY, of Ohio, United States of America. *A new and useful machine for making dovetails.* Patent dated April 26, 1855. (No. 947.)

This invention consists in giving obliquity to the cutting edges of the saws, in combination with inclined fronting-guides or tables on which the pieces to be mortised are to be brought up to the saws, and in arranging the series of chisels with inclined cutting edges over a double inclined cutting bed or table.

COIGNET, ROBERT PAUL, Captain en retraite du Génie, of Rue du Bac, Paris, France. *Certain improvements for rendering tissues waterproof.* Patent dated April 27, 1855. (No. 948.)

The composition of the inventor's waterproofing coating is as follows: linseed oil 100 parts, thick oil of tar 25 parts, gallipot oil 5, mineral pitch 2, white resin 5, Norwegian tar 5, mutton suet 10, oil of schistus 4, smoke black 1, amber earth 3, litharge 2, and alum 2 parts.

PAGE, THOMAS, of Middle Scotland-yard, Middlesex, civil engineer. *Improvements in ordnance.* Patent dated April 27, 1855. (No. 951.)

This invention consists in forming in the loading chamber of the gun, or the loading chamber and part of the gun, two or more touch-holes, so arranged as to facilitate the firing and explosion of the whole charge of powder.

MULLER, EMILE, civil engineer, JOSEPH GILARDONI, and XAVIER GILARDONI, of Rue de Provence, Paris. *A grooving and clamping hooked tile, by means of which the entire covering of a roof is tied together. A machine, for the fabrication of such tile by which it is continuously delivered from the mould through a peculiar system of delivery, applicable to any matter that may be moulded, and a continuous succession of furnaces for its burning.* Patent dated April 27, 1855. (No. 952.)

The inventors describe certain improved tiles, so shaped that a recess in one falls over a projection on the other, the whole being afterwards clamped together by means of metallic wires, &c.

CLARK, RICHARD, lamp-manufacturer, of

the Strand, London, and John Thomas Stroud, lamp-manufacturer, of Suffolk-street, Birmingham, Warwick. *Certain improvements in lighting, applicable to table, street, signal, and other lamps, as also for the constructing, denoting, and regulating the signals and burners of lighthouses.* Patent dated April 27, 1855. (No. 957.)

Claims—1. A mode of raising and lowering the cotton by a screwed wire; also a certain mode of making the inner case of burners. 2. A mode of constructing stuffing boxes for lamps. 3. The construction of a certain described lamp; also the making of the spherical head of it of polished silver. 4. A safe-guard for trimming lamps. 5. The application to pressure lamps of an alarm for indicating when they require winding. 6. A mode of constructing outside shop lamps without glass.

Warren, Daniel, of Exmouth, Devon, gentleman. *Certain improvements in obtaining and applying motive power.* Patent dated April 28, 1855. (No. 959.)

This invention relates to certain new mechanical arrangements or apparatus, designed for obtaining and applying motive power, the improvements being "based upon the principle of pneumatics and hydro-pneumatics," especially adapted to the construction of packing-presses, irrigators, fire-engines, and pumps.

Packman, Frank James Wilson, of Puckeridge, Herts, doctor of medicine. *Improvements in projectiles, in projectile instruments, and in the means of charging the same.* Patent dated April 28, 1855. (No. 960.)

A full description of this invention will shortly be given.

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *An improvement in file-cutting machinery.* (A communication.) Patent dated April 28, 1855. (No. 961.)

This invention consists of an improved chisel-arm, and holder, applicable to any file-cutting machinery now in use, requiring a chisel-arm and holder actuated by shafts and cams or other suitable contrivances.

Carrett, William Elliot, of the Sun Foundry, Leeds, York, engineer. *Improvements in motive-power engines.* Patent dated April 28, 1855. (No. 962.)

An illustrated description of this invention was published at page 250 of the current volume, No. 1675. The patentee's claims are, 1. The general construction and arrangement of certain parts of steam-engines, in which the same steam acts alternately on each side of the piston or pistons, as described. 2. The application and use in engines of the above class of one or more trunks, rams, or plungers, attached to that side of the piston on which the steam first operates, such trunks, rams, or plungers, working steam-tight in one or more suitable closed cylinders, or vacuum chambers attached to the end of the steam cylinder. 3. The constructing of the closed cylinders, or vacuum chambers, so as to constitute or form the air-pump or pumps of the engine. 4. The application and use in engines wherein the same steam is admitted alternately on each side of the pistons, of one or more trunks, rams, or plungers attached to the opposite side of the piston to that on which the steam first operates, but so arranged as not to diminish the effective area of that side of the piston.

Marsh, James, of Store-street, Bedford-square, Middlesex, pianoforte manufacturer. *Improvements in the construction of pianofortes, for rendering them more portable.* Patent dated April 28, 1855. (No. 963.)

These improvements consist in constructing the main body or frame of the instrument on which the strings are stretched, together with the sounding-board and case, in two or more parts, fitted to each other, so as to be readily capable of being separated.

Acres, Edward, of Pouldrew Mills, Waterford, miller. *Improvements in desiccating and cooling atmospheric air, and the application thereof to useful purposes.* Patent dated April 30, 1855. (No. 965.)

In carrying out this invention the air in a heated state is caused to pass into a vessel in which are contained a number of pipes, the temperature of which is kept low by the constant circulation of cold water through them. The air being drawn through the vessel will part with its moisture by condensation of its vapours, by coming in contact with the cold surfaces of the pipes and the interior of the vessel which forms the cistern for the cold water.

Johnson, William, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in regulating the pressure or flow of gas or fluid bodies.* (A communication.) Patent dated April 30, 1855. (No. 967.)

Claims.—1. A general arrangement and construction of apparatus. 2. The use in gas or fluid regulators of a cup valve, arranged to cut off the supply of gas, by dipping into an annular groove partly filled with mercury or other suitable liquid, and surrounding the mouth of the inlet pipe or aperture. 3. Certain modes of setting the valves and other moving details of gas or fluid regulators upon knife-edge centres.

Francis, Edward, of West Strand. *Improvements in manufacturing boots and shoes.* Patent dated April 30, 1855. (No. 969.)

This invention consists in the use of metal lasts, formed with recesses to receive pins or studs which keep the sole in its place;

and in preparing wedge-shaped pieces of metal, nails, and wooden pegs, used in making boots and shoes, by covering them with fixed oils, resins, wax, or gums, or any of them combined, to prevent them resting in the leather, and to make them stick more securely in it.

DEPIERRE, PIERRE, merchant, of Rue de Seine, Paris, France. *Improvements in dyeing, part of which improvements is applicable to the manufacture of ink.* (A communication.) Patent dated April 30, 1855. (No. 970.)

This invention consists in the employment of alder flowers, &c., to form a substitute for cream of tartar in the dyeing of wool and other substances; and to dye black cotton, silk, and other yarn or goods composed of mixtures of fibrous materials.

EASSIE, WILLIAM, of Gloucester, railway contractor. *Improvements in machinery or apparatus for stopping or retarding railway trains.* Patent dated May 1, 1855. (No. 973.)

This invention consists of an arrangement of tubes, wheels, &c.

KNOCKER, GEORGE WIGZELL, of Bushy Ruff, Dover, Kent, gentleman. *Improvements in motive power by means of water and air.* Patent dated May 1, 1855. (No. 974.)

Claim.—"Procuring by means of falling or descending water, with abstraction of friction, wholly or in part independent of mechanical agency, a vacuum or a partial vacuum."

HARTLEY, WILLIAM, of Bury, Lancaster, engineer. *Improvements in safety-valves and in apparatus connected therewith, applicable also to regulating the flow of steam for other purposes.* Patent dated May 1, 1855. (No. 975.)

This invention relates primarily to an arrangement of safety-valve "the principle of which consists in weighting the valve by the pressure of steam, which pressure upon being removed allows the said valve to rise from its seat and discharge steam: this arrangement is applicable as a safeguard against the effects of a vacuum in the boiler as well as against an excessive internal pressure." We may give a fuller description of this invention hereafter.

BOYD, JAMES EDWARD, of Hither-green, Lewisham, Kent, gentleman. *A ship's course indicator or exhibitor, for the purpose of exhibiting to the helmsman and others, in a legible manner, the course which a ship is to steer, as well as for certain improvements in ships' compasses.* Patent dated May 1, 1855. (No. 976.)

This invention mainly consists in constructing a supplementary apparatus to be placed by the side of the compass, by which the position of the ship's head may be accurately indicated to the helmsman.

BANKS, WILLIAM, mechanic, HENRY HAMPSON, bleacher, and JOHN BANKS, boiler-maker, of Bolton-le-Moors, Lancaster. *Improvements in machinery or apparatus for bleaching yarns or thread, either in the cop or hank.* Patent dated May 1, 1855. (No. 979.)

Claim.—The use of a closed chamber in connection with air and force pumps for the purpose of bleaching yarns, either in the cop or hank; and a certain arrangement of the several parts of the machinery or apparatus.

ADCOCK, ROBERT, of Wolverhampton, Stafford, engineer. *Improvements in the purifying processes of alcoholic liquids.* (A communication.) Patent dated May 1, 1855. (No. 980.)

"This invention consists," says the patentee, "in employing nitric acids in obtaining more pure alcohol, whether distilled from corn, potatoes, carrots, beet-roots, molasses, or other substances."

LILLIE, JOHN SCOTT, Companion Order of the Bath, of South-street, Middlesex. *Improvements in tents or other moveable habitations.* Patent dated May 2, 1855. (No. 982.)

These improvements consist in the construction of tents or huts composed of wood, metal, or other suitable material in two separate parts. "To form a large tent," says the patentee, "the two divisions are separated to the required distance, and poles or curtain-rods are secured to the roof and sides, then covered with canvas or other flexible material attached to spring rollers, and thus raised or lowered in the usual way."

LAMBERT, THOMAS, of Harrington-square, Middlesex, pianoforte-manufacturer. *Improvements in pianofortes.* Patent dated May 2, 1855. (No. 983.)

"I cause the hopper head," says the inventor, "to be connected with the hopper by a suitable regulating screw, secured in the upper part of the hopper and passing through the hopper head, so that the same may be adjusted thereon at any height required, and the said hopper head is also connected with the hopper by two pins fitted into corresponding apertures, which serve to steady and secure the hopper head at whatever height adjusted." The buffed check is secured at one end to the top of the hopper and at the other to the sticker, so as to meet each other in the ordinary way.

HARROLD, FREDERICK WILLIAM, of Birmingham, Warwick, merchant. *An improvement or improvements in the manufacture of the frames of slates used for writing on.* (A communication.) Patent dated May 2, 1855. (No. 984.)

Claim.—"Making frames of slates used for writing on of one strip of wood, cane,

gutta percha, metal, or other suitable substance as described."

Campain, Samuel William, of Deeping Fens, Lincoln, farmer. *Improved machinery for filling corn and other sacks.* Patent dated May 2, 1855. (No. 985.)

This machinery consists simply of a slanting frame which carries at its upper and lower ends pulleys round which an endless chain of buckets passes, for the purpose of raising the corn as it leaves the winnowing machine and discharging it into an elevated chamber.

Lee, Henry, the younger, of Lambeth, Surrey, contractor, and John Gilbert, of Hackney-road, Middlesex, engineer. *Certain machinery for mixing the substances used in the formation of concrete and other like substances.* Patent dated May 2, 1855. (No. 986.)

This invention consists in mounting a cylinder or case upon a shaft, and in providing such cylinder or case with an aperture and cover which forms both the feed and exit passages for the materials. Rotary motion is communicated to the cylinder, and after having been continued a sufficient time the cylinder is stopped with the aperture downwards, the cover is removed, and the concrete runs out. Half a revolution is given to the cylinder, a fresh charge is inserted, the cover placed over the aperture, and the operation repeated.

Mellier, Marie Amedie Charles, of Rue de Seine, St. Germain, Paris. *An improvement in the manufacture of paper.* Patent dated May 2, 1855. (No. 988.)

Claim.—Subjecting straw or other vegetable fibrous substances requiring like treatment to a boiling process in a weak solution of caustic alkali under considerable pressure.

Rowett, William, of Liverpool, Lancaster, merchant. *Improvements in fitting, handing, and reefing vessels' sails.* Patent dated May 3, 1855. (No. 991.)

The inventor describes certain methods of setting, reefing, taking in, and securing sails from the decks of vessels.

Platt, John, of Oldham, Lancaster, mechanical engineer, and James Taylor, of Hollinwood, overlooker. *Improvements in looms for weaving.* Patent dated May 3, 1855. (No. 992.)

This invention relates to a method of preventing the shuttle from accidentally flying from its race. For which purpose the inventors adapt a rod or rods, or other apparatus to the lathe, above the race, and extending across the width of the warp threads.

Fletcher, Fielding, of Birmingham, Warwick, manufacturer of water-closets and general plumbers' work. *Certain improvements in water-closets.* Patent dated May 4, 1855. (No. 994.)

This invention consists of certain improvements in proportioning the parts of water-closets to the work required, and in making them as much as possible self-acting.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Huddart, George Augustus, of Brynkir, Carnarvon, Esq. *Improved machinery for obtaining and applying motive power.* Application dated April 25, 1855. (No. 942.)

"By the discharge of an overshot stream of water into the endless chain of buckets greater power will be maintained," says the inventor, "than if the water were caused to act upon an ordinary bucket-water wheel, and this power I propose to employ in order to rotate a bucket-wheel, and by that means lift the water that has been discharged by the endless chain of buckets."

Elce, John, and John Bond, of Manchester, Lancaster, machinists. *Improvements in caseing, guarding, and protecting revolving shafts and mill work in general.* Application dated April 26, 1855. (No. 943.)

The inventors provide a casing which ordinarily revolves, but which ceases to revolve if a strap, getting off a drum, pulls upon it.

Fontainemoreau, Peter Armand Lecomte de, of South-street, London. *Application of certain primitive products to the manufacture of bearings, and all parts of apparatus subjected to friction.* (A communication.) Application dated April 27, 1855. (No. 949.)

This invention consists "in the employment of all kinds of granite or micaceous products, basalts, lavas, and other primitive products containing mica, feldspar, and quartz, or in some cases metallic combinations in a more or less oxidized condition, which are generally classed among the igneous formations, as also micaceous porphyries, for the manufacture of bearings for machinery."

Crosskill, Alfred, of Beverley, York, civil engineer. *Improvements in machinery for turning and spreading cut grasses or hay.* Application dated April 27, 1855. (No. 950.)

The inventor employs a series of wheels for driving the revolving rakes of the ordinary hay-making machine, arranged in such manner that the two wheels which carry the machine will cause the rakes to revolve in two different directions at the same speed.

Massiquot, Jean Charles Guillaume, of Paris, France. *Certain improvements in lithographic presses and inking apparatus connected therewith.* Application dated April 27, 1855. (No. 953.)

These improvements are embodied in a lithographic printing-press, having the following principal parts:—A sliding carriage which travels over the stone or other engraving, and carries along the printing scraper, to take off the impression, and which is moved to and fro by a crank on a shaft; a loose tilting frame which carries a plate and sheet to lie down upon the paper that has been put upon the plate to be printed, from the printing scraper passing over the sheet with the necessary pressure, and the loose tilting-frame being raised or tilted up by the said carriage at the end of each backward and forward stroke, so as to allow putting a fresh sheet of paper on the stone or plate engraved upon, &c.

COLLETT, HENRY, of Grosvenor-street, St. Peter's-street, Islington. *Improvements in pumps or machinery for raising water or other fluids.* Application dated April 27, 1855. (No. 955.)

The inventor employs a pipe, enlarged at its lower end, and works it within a fixed cylinder which is below the fluid, and has at its lower end a valve opening inwards, to allow the fluid to flow in when the pipe is rising, and to close when the pipe is descending. In the pipe is also a valve opening upwards, and the upper end of the pipe opens over a tank.

MYERS, EDWARD, of Rotherham, York, engineer, and JOHN WRIGHT POTTER, of the same place, gentleman. *Improvements in stoves for warming apartments.* Application dated April 27, 1855. (No. 956.)

The stove described by the inventors is composed of two chambers—a combustion-chamber, which may be heated by gas or other means, and a heat-chamber, which is placed immediately above it. Within the latter is fitted a conical reflector, having its apex downwards, by means of which a portion of the heat from the chamber below will be thrown down on to the floor. Other reflectors, &c., are also provided.

KNOWLES, THOMAS, and JAMES KNOWLES, of Manchester, Lancaster, engineers. *Improvements in steps and bolsters to be used in machinery for spinning, doubling, winding, and similar processes.* Application dated April 28, 1855. (No. 958.)

This invention consists in substituting hardened cast-iron steps and bolsters, for those of brass, now in general use.

BURNS, ROBERT, of Liverpool, Lancaster, engineer. *Improvements in propelling vessels.* Application dated April 30, 1855. (No. 964.)

The inventor places across the vessel a driving-shaft which extends beyond her sides, and upon each end of which three or more cranks or excentrics are formed. Either before or abaft the driving-shaft there is a second or duplicate set of cranks or excentrics which are connected to the first by means of horizontal coupling or connecting-rods, and to these latter floats are affixed. The sets of excentrics keep the floats vertical.

WALLWORTH, JOHN, and DANIEL TAYLOR, of Manchester, Lancaster. *An improved stand-pipe for hydrants.* Application dated April 30, 1855. (No. 966.)

Instead of working the stand-pipe of the hydrant by a screw the inventors propose to work it by a lever in order to avoid the friction on the hydrant ball, which must necessarily take place by the constant turning of the screw. The lever is worked by a handle at the bottom part of it, which acts on the ball of the hydrant.

BUCHANAN, ARCHIBALD, of Catrine, Ayr, manufacturer, and JAMES BARCLAY, of the same place, manager. *Improvements in beetling or finishing textile fabrics.* Application dated April 30, 1855. (No. 968.)

In the machine described by the inventors a number of double-headed beetles are set upon an axis considerably below the level of and between two rollers or beams round each of which a piece of the fabric to be beetled is passed. These beetles are made to vibrate between the two rollers, each beetle striking the rollers alternately by means of two wiper shafts, placed one on each side of the axis of vibration but at a slightly higher level.

TORBITT, JAMES, of Belfast, Antrim, Ireland, wine merchant. *Improvements in the treatment and preservation of a constituent part of the potatoe.* Application dated May 1, 1855. (No. 971.)

The inventor proposes to adopt methods by which the fibrine, as well as the farina of the potatoe may be preserved.

HUNT, THOMAS, of the London and North Western Railway Engine Works, Crewe, Chester, civil engineer. *Improvements in the permanent way of railways.* Application dated May 1, 1855. (No. 972.)

This invention consists in splitting rails longitudinally into two parts, and laying these down so as to break joint with each other.

FISHER, GEORGE, of Cardiff, Glamorgan, engineer. *An improved buffer for railway carriages.* Application dated May 1, 1855. (No. 977.)

This invention is applicable chiefly to waggons, and consists of, two rectangular metal frames made to slide one over the other; one frame is fixed to the sole of the waggon, and the other to the buffer head; cork shavings or other suitable elastic materials are interposed between the two frames. The frames are held together by a

bolt, which passes through them, and the play of the buffer is provided for by slots, cut in two sides of one of the rectangular frames. The distance to which the slots can move is governed by the ends of the bolt.

WRIGHT, LEMUEL WELLMAN, of Birmingham, Warwick, engineer. *Certain improvements in locks.* Application dated May 1, 1855. (No. 978.)

This invention consists in constructing a form of lock in which the key has to pass one or a series of slotted plates or wards, which it meets at every half turn. A screw pin, being an exact counterpart of the key, which is a screw key, is fitted to the lock plate, and receives the key, on the lower end of which may be a bit to catch one or more tumblers. A cam piece is attached to the stem of the screw pin at its lower end, and under the bolt, and when in a state of rest, is in a line almost parallel with and against a portion of the bolt. The tumbler or tumblers are applied to the side of the bolt, working by means of a spring in a slot or notch, which tumblers are raised by the key in the act of locking only, and not when applied for unlocking; the screw key both in locking and unlocking turns in the same direction.

HEMSLEY, WILLIAM, of Melbourne, near Derby. *Improvements in cutting warp fabrics.* Application dated May 1, 1855. (No. 981.)

These improvements consist in applying knives or cutters to warp frames or machines in which warp fabrics are made, such knives or cutters being on suitable axes or bars, which, by the working of the machine, or by the workman, are moved so as to bring the knives into, and to take them out of action, and thus to cut parts of the fabric whilst in the frame or machine, and whilst the machine is working.

BRIDSON, THOMAS RIDGWAY, of Bolton-le-Moors, Lancaster, bleacher. *Improvements in preparing, beetling, or finishing textile fabrics.* Application dated May 2, 1855. (No. 987.)

This invention relates to a mode of treating or preparing textile fabrics in such manner as to produce a beetling or finishing effect entirely by rotatory action upon the goods.

BASFORD, WILLIAM, of Penclawdd, Glamorganshire, engineer. *Improvements in purifying coal-gas, and for obtaining a residuum therefrom which may be used as a pigment or colour, or for other useful purposes.* Application dated May 3, 1855. (No. 989.)

This invention has reference to an improved method of purifying coal-gas by charging a chest or vessel with charcoal, peat, or other like substance, heating the same, and causing the gas after it leaves the retort to pass through it.

BURGESS, JOHN, junior, of Birmingham, Warwick, manufacturer. *A new or improved comb.* Application dated May 3, 1855. (No. 990.)

This invention consists of a comb on the back of which is a tube or reservoir for the purpose of holding oil or other liquid, and suitable channels, &c., for supplying the latter to the hair.

HORTON, THOMAS, of Birmingham, Warwick, manufacturer. *An improvement in the manufacture of charcoal and pyroligneous acid.* Application dated May 4, 1855. (No. 993.)

The inventor subjects spent tan to heat in a distillatory apparatus; the pyroligneous acid is obtained in the volatile products which distil over, and the charcoal remains in the retort.

MARKS, WILLIAM HENRY, of London, gentleman. *Signalling the approach of vessels at sea.* Application dated May 4, 1855. (No. 995.)

This invention consists in furnishing vessels severally with a bell or series of bells, which may be set in motion when requisite by the hand, or by any suitable mechanism actuated by clockwork, the motion of the ship, or any convenient power, so as to ring in such combinations as may be requisite.

TROTMAN, JOHN, of Cornhill. *Improvements in the manufacture of screw and other submerged propellers.* Application dated May 4, 1855. (No. 1001.)

This invention has for its object the use of gutta percha, a compound thereof, or of India-rubber compounded with sulphur and changed by heat, in making screw and submerged propellers.

DICKSON, JAMES HILL, of Rotherhithe, Surrey, flax-manufacturer and flax-machinist. *Improvements in machinery for scutching and heckling flax, hemp, and other vegetable fibres.* Application dated May 5, 1855. (No. 1005.)

A description of this invention will be given hereafter.

PROVISIONAL PROTECTIONS.

Dated July 18, 1855.

1609. Théophile Louis Marie Riot, chemist, and Sylvain Guillaume Paul Dehais, banker, of Paris, France. Improvements in the treatment of silk.

Dated October 9, 1855.

2252. Ellis Rowland and James Rowland, of Manchester, Lancaster, engineers. Certain improvements in locomotive steam-engines.

Dated November 2, 1855.

2447. Isham Baggs, of Pentonville, London, engineer, and Henry Porter Osman, of Essex-

street, London. Improvements in steam-engines and in engines generally which are worked either by gas, air, or vapour, and in apparatus for generating electricity, for effecting parts of said improvements, and for other purposes.

2449. Mark Osborne, of Birmingham, Warwick, manufacturer. Improvements in metallic bedsteads and other articles of metallic furniture.

2451. Robert Cook, of Glasgow, Lanark, engineer. Improvements in apparatus for effecting the operations of punching, rivetting, and shearing.

2453. Samuel Heseltine, of Harwich, Essex, gentleman. Improvements in the means of ascertaining the depth of water in rivers, harbours, and at sea.

2455. John Jones, of St. Asaph, Flint, North Wales. Improvements in electric telegraphs.

Dated November 3, 1855.

2457. James Heginbottom, of Ovenden, Halifax, York, cotton-spinner. Improvements in furnaces and apparatus for generating steam, whereby the smoke will be consumed and the fuel economised.

2459. James Pattison, of Glasgow, Lanark, merchant. Improvements in machinery for dressing and finishing woven goods and fabrics.

2461. Thomas Robert Cooper, of White Mill-cottage, Battersea fields, Surrey, gentleman. Obtaining motion with power and velocity by purely mechanical means.

2463. James Binning, of Liverpool, Lancaster, embossing press - manufacturer. Improvements applicable to embossing presses.

2465. Thomas Ridgway Bridson, of Bolton-le-Moors, Lancaster. Improvements in preparing, beetling or finishing textile fabrics.

2467. William Prior Sharp, and William Weild, of Manchester, Lancaster, silk manufacturers. Improvements in the reeling or winding of cocoons, and in the manufacture of silk threads, and in machinery and apparatus for these purposes. Partly a communication.

2469. George Lloyd, of Birmingham, Warwick, glass-manufacturer. Improvement or improvements in illumination.

2471. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in knitting-machinery. A communication.

Dated November 5, 1855.

2473. Robert Spring Garden, of Piccadilly, Middlesex, army accoutrement-maker. Improvements in the manufacture of hats.

2475. Arthur Dobson, of Belfast, Antrim, Ireland, bleacher. Improvements in preparing certain unbleacled linen fabrics.

2477. James Nuttall, of Silver-street, London, glove-manufacturer. An improved gauntlet-glove and cuffed glove.

2481. George Burridge, of Great Portland-street, Middlesex, architect. Improvements in the preparation of glass for ornamental purposes.

2483. George Baring Locke, of Notting-hill, Middlesex, railway clerk. Apparatus, apparatuses, or mechanism, for placing detonating or fog-signals on the rails of railways to be exploded thereon, and for removing the same therefrom whenever required.

2485. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved apparatus for cooling and drying flour. A communication.

2487. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in fire-arms. A communication.

Dated November 6, 1855.

2489. Frederic Ludewig Hahn Danchell, of Arthur-terrace, Caledonian-road, Middlesex, civil engineer. Certain improvements in apparatus for ascertaining the pressure of steam, air, water, or any other fluid or liquid.

2491. Joseph Schloss, of Wellington-chambers, Cannon-street West, London. A new mounting for travelling-bags.

2493. Samuel Cunliffe Lister, of Manningham, near Bradford, York. Improvements in weaving pile fabrics.

Dated November 7, 1855.

2497. Charles Hanson, of Pimlico, Middlesex, gun-smith. Improvements in fire-arms.

2499. Joseph Haley, of Manchester, Lancaster, engineer. Improvements in the buffers and spring draw-bars of waggons or other railway vehicles, and in the application of the same.

2501. William Grindley Craig, of Gorton, near Manchester, Lancaster, engineer. Improvements in bearing, buffing, and draw-springs, applicable to the rolling stock of railways and other vehicles.

2502. William Kenworthy, of Blackburn, Lancaster, manufacturer. Certain improvements in steam-engine valves, and in the mode of working the same.

2503. William Davis, of Northampton-place, Old Kent-road, Surrey. Improvements in the construction and arrangement of furnaces and furnace bars for the better combustion of smoke and prevention of loss of heat by radiation.

2505. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the manufacture and application of prussiates and other colouring matters. A communication.

2507. William Dray, of Swan-lane, London, agricultural implement manufacturer. Improvements in apparatus for heating, baking, and drying.

2509. William Lund, of Fleet street, London, manufacturer, and Alexander Bain, of Paddington, Middlesex, engineer. Improvements in pencil-cases.

2511. Charles Allen Browne, of Massachusetts, United States. A machine for manufacturing bricks. A communication.

2513. George Tomlinson Bousfield, of Sussex-place, Brixton, Surrey. Improvements in wrought-iron shafts for steam-boats, and other purposes where great strength is required. A communication from Otis Tufts, of Boston, United States.

2515. Thomas Burgin, of Great Winchester-street, London, upholsterer. An improved construction of ledger hand-rest.

Dated November 8, 1855.

2517. Charles Page, of Ware, Herts. An improved construction of railway-signal apparatus.

Dated November 9, 1855.

2521. John Raywood, engineer, of Wentworth, Yorkshire. An improved rolling, dribbling, sowing, and harrowing machine for wheat and other agricultural produce.

2523. Henry Fletcher, of Manchester, Lancaster, engineer. Improvements in the manufacture of nuts, bolts, and other similar articles, and in machinery or apparatus for making the same.

2525. William Henry Walenn, of Regent-street, Middlesex, civil engineer. Certain new and useful improvements in looms for weaving seamless bags and other open double fabrics of a similar character. A communication from George Copeland, of Lewiston, United States.

2527. Thomas Pritchard, of Walsall, engineer. Improvements in manufacturing welded iron tubes.

Dated November 10, 1855.

2529. William Henry Bentley, of Bedford, engineer. Improved cannon, guns, and other fire-arms, and appendages thereto, and in the capsules, cartridges, and projectiles for the same and other fire-arms.

2531. Louis Eskell, of Cockspur-street, Middle-

sex, surgeon-dentist. A new enamel for filling of stopping decayed teeth.

Dated November 14, 1855.

2566. Cyprien Marie Tessié du Motay, of Paris. Improvements in the treatment of fatty and oily matters.

Dated November 16, 1855.

2582. Charles Crum and Charles Paul, of Hudson, New York. Process for making bread.

2586. Thomas Hudson, of Warrington, Lancaster, whitesmith. Improvements in machinery or apparatus for cutting and punching metals, paper, leather, and similar articles.

2588. James Hinks, of Birmingham, Warwick, manufacturer, and Frederick Dowler, of Birmingham, machinist. New or improved machinery for the manufacture of percussion-caps, and for cutting out and raising articles in metal generally.

Dated November 17, 1855.

2592. John Hosking, of Gateshead Iron Works, Durham, engineer. Improvements in vertical direct-action marine-engines.

2594. Henry Ball, of Great Russell-street, Birmingham, Warwick, gun-maker. An improvement in gun-sights.

2598. George Collier, of Halifax, and James William Crossley, of Brighouse, York. Improvements in finishing fabrics and in treating yarns, part of which improvements is also applicable to producing ornamental effects upon other surfaces.

Dated November 19, 1855.

2600. John Fleetwood, of Elm-grove House, Southsea, Southampton, gentleman. An improved portable apparatus for making malt, and for drying hops, corn, and other grains and seeds.

2602. William Smith, of Salisbury-street, Adelphi, civil engineer. Improvements in gas-regulators. A communication.

2604. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in apparatus for measuring liquids, which may also be employed as a motive power-engine. A communication.

2606. Jeanne Barbe Ve. Lopez, Rue de Bretagne, Paris, France. An antibilious powder.

2608. William Henry Preece, of Bernard-street, Primrose-hill, Middlesex. Improvements in electric telegraphs.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2623. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, sworn interpreter Imperial Court of Paris. Making metallic chains. A communication from Edward Weissenborn, of New York, United States. November 21, 1855.

JEFFERY'S APPLICATION FOR PROLONGATION OF PATENTS.

The Judicial Committee of the Privy Council have appointed Friday, the 1st of February next, at half-past 10 A.M., for the hearing of the petition in the above matter.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December 4th, 1855.*)

1609. Théophile Louis Marie Riot and Sylvain *Guillaume* Paul Dehais. Improvement in the *treatment* of silk.

1657. John Walter Cawley Wren. An improved construction of folding perambulator.

1659. George Hepplewhite. Improvements in spare rudders for ships.

1669. George Handson Rollet. Improvements in projectiles for fire-arms.

1676. Benjamin Wood. An improved preparation of colouring matter for the manufacture of ink, artist's colours, and for other purposes for which such colouring matter may be applicable.

1692. David Davies. A self-evident economic boiler for heating with hot water buildings of every description.

1693. Christian Schiele. Certain improvements in obtaining and applying motive power.

1697. John Hunt. An expanding and contracting self-fastening band.

1707. Charles Hodges. Improvements in machinery or apparatus for knitting plain, ribbed, or figured hosiery. A communication.

1727. Joseph Marie Fillier. Certain improvements in looms for weaving.

1735. Nehemiah Brough. Improvements in the manufacture of clasps and buckles.

1741. Samuel Mellor and Thomas Young. Improvements in machinery for supplying water to steam-boilers.

1747. Alexander Allan. Improvements in the valve-gear of locomotive and other engines.

1756. Joseph Lane. An improvement or improvements in the manufacture of gold-leaf.

1762. Richard Albert Tilghman. Improvements in the manufacture of alkalies and alkaline earths.

1797. Philippe Amédée Devy. Improvements in hair fabrics. A communication.

1821. Edwin Ullmer and William Ullmer. Improvements in machines for cutting paper, card, and millboards, and other like substances.

1823. Thomas Hewitt. Improvements in machinery for pulverizing and levigating by means of pestle and mortar.

1826. Charles Evans Reeves. Improvements in the construction of repeating fire-arms.

1828. Louis Turietti. A portable alarm-apparatus for the prevention of robbery by false keys, &c.

1830. Edmund Topham. Apparatus for cleansing out the sediment from the water in steam-boilers, and for preventing incrustration of the same.

1837. Thomas Butler. Improvements in locks.

1910. William Johnson. Improvements in machinery or apparatus for rolling or shaping metals. A communication.

2032. Robert Barnard Feather. Improvements in the make and construction of shells and balls to be used with cannon or other artillery or fire-arms.

2147. Felix Bouchet. An improved mechanical arrangement for elevating or lowering, and moving forward or backward, heavy or submerged bodies.

2249. Perceval Moses Parsons. Certain improvements in connecting and securing the joints of pipes and tubes.

2363. Vincent Scully and Bennett Johns Heywood. Improvements in clips or holders for suspending railway-tickets and other small articles.

2429. Thomas James Swinburne. Improvements in furnaces or apparatus used in the manufacture of glass.

2431. Richard Pannell Forlong. An improved manufacture of manure.

2436. Richard Reeves Cox. Improvements in the manufacture of artificial fuel.

2439. William Taylor. An improvement or improvements in the manufacture of iron.

2465. Thomas Ridgway Bridson. Improvements in preparing, beetling, or finishing textile fabrics.

2485. Alfred Vincent Newton. Improved apparatus for cooling and drying flour. A communication.

2491. Charles Hanson. Improvements in fire-arms.

2502. William Kenworthy. Certain improvements in steam-engine valves, and in the mode of working the same.

2513. George Tomlinson Bousfield. Improvements in wrought-iron shafts for steamboats, and other purposes where great strength is required. A communication.

2526. Charles Joseph Hampton. Improvements in the manufacture of iron.

2528. William Peter Piggott. Improvements in galvanic, electric, and electro-magnetic apparatus, and in the mode of applying the same as a curative and remedial agent.

2529. William Henry Bentley. Improved cannon, guns, and other fire-arms, and appendages thereto, and in the capsules, cartridges, and projectiles for the same and other fire-arms.

2530. Joseph Scott. Improvements in corking bottles, jars, and other receptacles.

2604. Richard Archibald Brooman. Improvements in apparatus for measuring liquids, which may also be employed as a motive-power engine. A communication.

2606. Jeanne Barbe Ve. Lopez. An anti-bilious powder.

2623. Alexandre Tolhausen. Making metallic chains. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

918. Joseph Skertchley, junior.
924. William Slater.
930. John Dable and William Wells.
935. James Edward McConnell.
936. John Norton.
944. Page Dewing Woodcock.
949. John Bethell.
958. Alexander Lawrie.
961. Joseph Cliff.
962. William Maugham.
964. Isac Lewis Pulvermacher.
1001. Anthony Norris Groves and Conrad William Finzel, junior.
1068. Anthony Norris Groves.
1103. Edward Schischkar.
1146. Nicolas Malinau.
1152. Fulcran Peyre and Michel Dolques.
1180. William Busfield.

LIST OF SEALED PATENTS.

Sealed November 23, 1855.

1157. Johan Jacob Meyer.
1165. William Smith.
1166. William Smith and Nathaniel Fortescue Taylor.
1167. James Atkinson Longridge.
1179. Joseph Addenbrooke.
1191. Frederick Herbert Maberly.
1193. Thomas Mather.
1200. Auguste Edouard Loradoux Bellford.
1202. Théodore Marie Rabatté and Jacques Rettig.
1206. François Théodore Botta.
1252. Peter Armand le Comte de Fontainemoreau.
1334. John Henry Johnson.
1398. John Macintosh.
1416. William Edward Newton.
1516. Julien Arnold Bellay.
1548. Joseph Wilson.
2002. Warren de la Rue.
2012. George Peacock.
2024. Richard Archibald Brooman.
2066. John Macintosh.
2132. Charles Manby.

Sealed November 26, 1855.

1213. John Morrison.
1215. Eugène Michel Roch.
1221. Henry Grafton.
1239. Emanuel Wharton.
1246. Samuel Bickerton.
1247. Antoine Bernard Alfred Baron Espiard de Cologne.
1270. Horace John Kaye and Percy Burrell.
1273. Edmund Morewood and George Rogers.
1275. William Edward Newton.
1283. Thomas Barrows.
1296. John Boucher.
1299. John Ramsbottom.
1319. Thomas Bright.
1321. Joseph Robinson.
1336. John Joseph Liebisch.
1349. Edward Rush Turner and Frederick Turner.
1355. George Arthur Biddell.
1358. Ebenezer Hollis.
1379. Louis Henri Réal.
1418. John Louis Jullion.
1425. Richard Keevil.
1472. John Raywood.
1513. Richard Archibald Brooman.
1637. Mathieu François Isoard.
1877. Alfred Savage.
1985. James Timmins Chance and Henry Adcock.
1995. Cyrus Clark and James Clark.
2001. Charles Gustav Mueller.
2005. William Southwell.
2035. Thomas Hemsley and William Hemsley.
2057. Matthew Curtis and John Wain.
2061. John Macintosh.
2065. Benjamin Barber, John Butterfield, and Thomas Austin.
2077. George Dewdney.
2165. Thomas Barrows.

Sealed November 30, 1855.

1254. Charles Isidore Constant Venant.
1257. Henry Spencer.
1258. John Boyd.
1259. John Lane and John Taylor.
1262. Charles Little.
1276. Francis Puls.
1287. Alexander Norton and Edmund Hunt.
1288. John Gedge.
1378. Isidore Carlhian and Isidore Corbiere.
1433. Simon Eugene Gabriel Simon.
1434. Stephen White.
1450. John Page.
1486. Joseph Eccles.
1590. William Henry Tayler.
1770. Arthur Warner.
2212. Henry Oldham.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Taurus.—Your questions shall be answered in our next.

G. Young.—You had better write to the Patent Department of this Office for the information you ask for in the first part of your letter. The changes you suggest in the indices and abstracts of specifications would be unsatisfactory to the majority of our readers.

J. Clare, jun.—We have not space for your letter of the 3rd.

J. F.—We abstain from answering questions similar to your first; your last we cannot answer.

Microcosmos.—We should be glad if you would put your communication into the form of a letter.

C.—We are unable to devote the space your letter would require to the further discussion of the subject of it.

Ignoramus.—Your view of the collision case is the correct one.

M. Bain.—You seem to misapprehend the problem in question. Will you send us your solution in a more complete form?

P. M. Parsons.—Yours came too late for insertion in this number.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

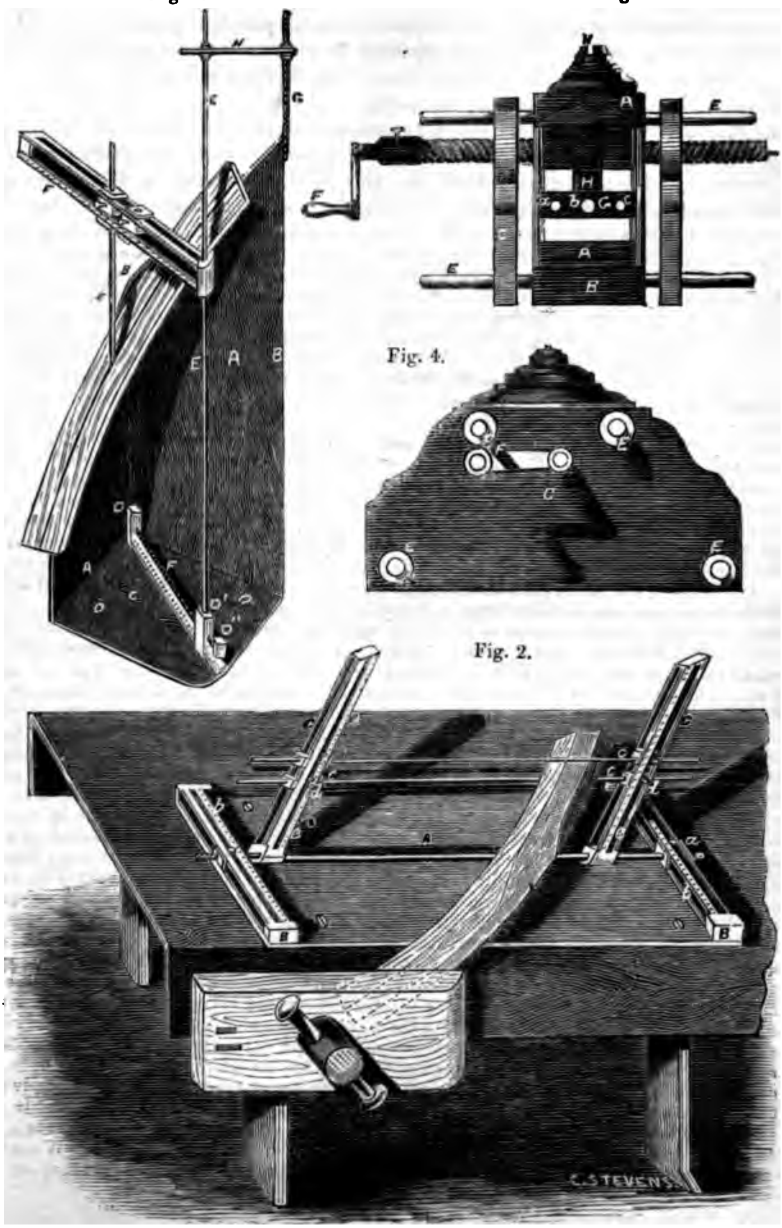
Mechanics' Magazine.

No. 1688.] SATURDAY, DECEMBER 15, 1855. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

VICTORY'S MACHINERY FOR MARKING OUT, BORING, AND SAWING HAND-RAILS, ETC.

Fig. 1. Fig. 3.



VICTORY'S MACHINERY FOR MARKING OUT, BORING, AND SAWING HAND-RAILS, ETC.

(Patent dated April 25, 1855.)

Mr. J. J. Victory, carpenter, of Henrietta-street, London, patented on the above day apparatus for marking out curved lines upon wood and stone, specially adapted to the marking out of hand-railings, together with improved machinery for boring and sawing wood.

The invention consists, firstly, of an apparatus for marking out upon the wood for forming "wreaths" for handrails such cylindrical forms and delineations as the wood has afterwards to be cut or reduced to by the ordinary methods now practised. The inventor first forms a pattern or mould of the proper geometrical curve, the sides of which are parallel. He then cuts out, by hand-sawing or otherwise, a square piece of timber to the exact curve of the mould. The piece of wood when, thus prepared, has given to it by the ordinary and well-known geometrical rules for cutting wreaths the proper bevel or pitch; or the pattern or mould is formed by means of the apparatus represented in fig. 1 of the engravings on the preceding page for marking out the section of a cylinder or the moulds for the wreaths of hand-rails. A, A is a box, the two sides of which are cut to the height or pitch the hand-rail is required to be over the stairs; B, B are the sides, and C the bottom of the box; D, D′, D″ are three blocks, two of them, D, D″, being stationary, while the centre block, D′, is capable of being moved to and fro on a screwed rod which is fastened at each end to the stationary blocks, D, D″. The centre block, D′, has on its top side a hole, in which is fitted a vertical round rod, E. This rod serves as the centre of the radius required for marking out the mould. The angle of the box is determined by placing a thin piece of wood up the vertical side, and marking the inclined plane upon it, which will give the plumb line and a bevel applied at right angles to the side, and the mould will give the required angle or bevel. F is an arm revolving round the vertical rod, E, which is furnished with a marker or pencil, *e*, so as to describe the required circle in the centre of the mould. G is an upright piece, bolted to the side of the box, and having attached to it at its upper end a bar, H, for supporting the upper end of the rod, E. A wrench is provided for turning the nuts when required to fix or shift the moveable block, D′, and the sockets in the revolving arm carrying the pencil. The piece of wood when marked out is cut either by hand or by a saw frame (hereafter described), after which it is fixed at the required angle in the bench, and the marking apparatus applied for delineating the cylindrical curve or form, both concave and convex, to which the wood has now to be reduced for completing the wreath. This apparatus is represented in fig. 2, and consists of a longitudinal shaft or round bar, A, placed parallel with the front of the bench, and having fixed to it at both ends a square sliding piece, *a*. These pieces, *a*, *a*, slide to and fro in the slotted gauges, B, B, fixed down firmly to the bench, and are capable of being adjusted by thumb screws according to the graduations, *b*, *b*, upon the surface of the fixed gauges. These graduations represent the radius of the circle to which the wreath is to be cut. Upon the longitudinal shaft, A, are placed two slotted arms, C, C, which are capable of being shifted nearer to or farther from each other. Each arm supports two sockets, *c*, *c*, which are free to slide up and down in the slots when required, but can be fixed in any desired position by the set screws, *d*, *d*, according to graduations, *e*, *e*, upon the surface of the arms, corresponding with and similar to those upon the fixed gauges. The sockets, *c*, *c*, have drilled through them a circular hole parallel to the longitudinal shaft, through which is passed the marker for delineating upon the wood the cylindrical curve. The marker may consist of an ordinary pencil, or a pointed iron rod, or other suitable tool. The method of using this apparatus is as follows:—The curved piece of wood being fixed in the bench, as shown in fig. 2, the marker is placed in one of the sockets, *c*, and the arm brought up to the wood at the proper point, when the arm and marker are caused by the workman to travel along the fixed rod, A, and by pressing upon the end of the marker the proper curve is delineated upon the wood, which is then removed and cut to the line marked out. Two sockets are placed to each arm, in order that both the concave and convex curves may be marked out. The sockets of each arm nearest to the longitudinal shaft are for marking the concave or inner curve, and the farthest sockets are for marking the convex or outer line. The space between the sockets corresponds to the thickness of the wood. After the wood has been cut to the curves delineated, it is brought back to the bench, and a rod or rods passed through the sockets of both the arms, C, C, whereby the correctness of the work is proved. When the pieces have been shaped and proved, it is necessary for forming the wreath that they should

be accurately fitted together. This is accomplished by a centre screw and a couple of dowels, one on each side of the screw. It often happens when these screws and dowels are placed in by hand, that, from a slight inaccuracy in boring the holes previously to inserting the screws and dowels, a good joint is not made.

To obviate this, Mr. Victory has invented a machine, which forms the second part of his invention, and consists of an improved clamp and guide for both holding the wood firmly in its place, and for accurately directing the bit into the end of the wood. Fig. 3 represents an end view, and fig. 4 a side elevation, of this improved clamp and guide. A, A is a box, and B a sole piece; C, C are the sides of the clamp, which are capable of being shifted nearer to or farther from each other, in order to receive different sized pieces of wood, by means of the right and left handed screw, D, tapped through corresponding nuts in the sides; E, E are guides projecting from each side of the box, and on which the sides, C, C, slide; F is a crank handle on the end of the screw, D, for setting it in motion; G is a guide, free to slide up and down in the box, A; and H a screw, by which the guide is raised or lowered to the required position for boring the holes in the end of the wood; *a, b, c* are three holes pierced through the guide, G, which serve to direct the centre-bit into the wood, and to insure that the holes when thus drilled shall always be parallel and coincide with the holes in the ends of all the pieces of wood. The centre hole, *b*, is for the reception of the screw, and the two other holes, *a, c*, for the dowels. The ends of the pieces forming the wreath, when thus drilled and fitted together, will be found to be perfectly accurate.

The invention has reference, thirdly, to an improved saw frame, for squaring or cutting out the hand rail wreaths and other forms in wood. It consists of a couple or more of thin saw blades, mounted in a suitable framework, and connected together by side rods. The saws are caused to reciprocate by means of a steam engine or other prime mover. The wood to be cut is guided to the saws by suitable parallel guides and stops, which have slots formed in them, whereby they can be set and retained at any required angle by set screws, and the wood can be cut to any bevel desired.

ASSOCIATION FOR THE PREVENTION OF STEAM-BOILER EXPLOSIONS.

The first annual general meeting of members of the Association for Preventing Steam-boiler Explosions, and for Effecting Economy in the Raising and Use of Steam, was held on Tuesday, November 27th, at the Town-hall, Manchester. Mr. Henry Houldsworth, the president, occupied the chair, and there was a good attendance of members, amongst those present being Messrs. Thomas Bazley, William Fairbairn, Richard Birley, Thomas Cooke, George Peel, Edmund Ashworth, J. M'Connel, and Alfred Neild; Thomas Booth, James Petrie, Thornton Littlewood, and Joshua Radcliffe, Rochdale; James Platt and J. A. Knight, Oldham; R. Peacock, Gorton, &c. Mr. Henry Whitworth, the secretary, read the circular calling the meeting, and also the report of the committee.

From this report it appears, that 269 firms have joined the association, employing 920 steam-boilers in their establishments, of which 843 are reported as being in daily use. The receipts from assessments amount to £1,216 17*s.* 6*d.*; the disbursements to this date, £1,000 2*s.* 3*d.*; leaving a balance in the hands of the treasurer of £216 15*s.* 3*d.* In addition to this sum there has been received from entrance fees, the sum of £530 8*s.*

The report proceeds as follows:—"No explosión or accident has occurred in any boiler under the supervision of the association. The chief inspector has, however, reported several cases of imperfection tending to accidents, and, in particular, has found many flues so constructed as to transmit heat directly to the steam in the boiler, not only when the water is deficient, but when at its daily working level, thus surcharging the steam with heat, and endowing it with one essential element of explosive power, which may be instantly developed by the admixture of water, by agitation, or otherwise. The fact that steam, in contact with water in a quiescent state, may be heated to 500° or upwards, without any corresponding effect on the steam-gauge, or proportionate increase of pressure, appears to be established on good authority. But the precise condition under which the surplus heat thus accumulated in the steam may combine with water to produce explosion is not fully known; and your committee recommend to their successors the investigation of this important point by experiment, as a proper subject for this association to determine. In like manner, the economical effect, if any, obtained by heating steam in its passage from the boiler to the steam-cylinder, for the purpose of gaining pressure by its expansion, demands investigation;

as also the still more important question of the strength of plate-iron tubes or internal flues to resist external pressure, for estimating which no data has yet been made public. In the important branch of effecting economy in the raising and use of steam, some progress has been made in collecting facts bearing on the question, and sufficient have been obtained to prove a great waste of fuel in many establishments. It has been ascertained that the consumption of coal for indicated horse power per hour, ranges in different cases from three to twelve pounds, and after making every allowance for differences in the quality of coal, and for the employment of part of the steam in heating and other purposes, there remains a vast field for pecuniary saving. It is also found that the waste lies not only in the faulty construction and ill-adapted proportions of furnaces and boilers, but also in the mode of applying and using the steam when raised. The clouds of dense smoke, indicative of imperfect combustion, testify to the defects of too many furnaces, and indicator diagrams attest in like manner the waste of steam, showing in some cases, in which high and low-pressure cylinders are worked together, a loss of ten pounds or upwards of pressure between the exhaust side of the one cylinder and the steam side of the other. Your committee look forward with confidence to important improvements in these particulars, by the daily experience in inspection now acquiring, and in the supervision provided."

From the report of Mr. Longridge, the chief inspector of the association, we extract the following:—"This deficiency of water is evidently the most frequent cause of explosion, and as it is important to provide such means of prevention as will be effective in case of negligence on the part of the fireman, I would suggest, 1st, the general adoption of open-stand pipes, where applicable, or safety-valves, in connection with a float, to allow the escape of steam, whenever the water falls below the fixed limit. 2nd. The use of fusible metal plugs, fixed on the top of the flues above the fire. These should stand sufficiently high to melt before any part of the flues could be uncovered with water. The usual practice of inserting a lead rivet or plug in one of the plates is worse than useless, inasmuch as, owing to the inclination usually given in setting boilers, a considerable portion of the flue must be exposed, and may even become red-hot, before such lead plug can be melted; under which circumstances an explosion is the probable consequence.

* * *

"*Although* the possibility of surcharging steam, while in contact with water, is still disputed by many engineers in this country, this question was satisfactorily solved by a committee of the Franklin Institute, in America above twenty years ago. In the report of this committee, it is stated that 'the temperature was carried to 533 degrees Fahr., when the pressure, shown by the gauge, was 6·82 atmospheres; while saturated steam, at that temperature, would have had a pressure of more than 60 atmospheres;' and further, 'these experiments, which lasted more than two hours, show that the surcharged steam remained in contact with water, without acquiring from it the water necessary to convert it into saturated steam, but retaining its surcharged state.' Several instances which have come under our own observation might be adduced in confirmation of the experiments of these gentlemen; but I shall only mention one, which lately occurred, as sufficient for our present purpose. The boiler referred to contained two internal furnaces, uniting in one flue, and had been filled with water to the usual height by a pipe leading from a reservoir. The end of this pipe was about 9 inches below the top of the furnaces. About two hours after lighting the fires, the steam (being at 8 lbs., as indicated by the gauge) was turned into the mill for the purpose of warming it. Shortly after this, the attendant observed that the water had disappeared from the gauge-glass, and was forced back into the reservoir, the valve on the feed pipe not having been entirely closed. At this time the upper part of the furnaces, above the surface of the water, had become red hot, and the temperature of the steam was such that a block of wood, resting on the top of the boiler, was converted into black charcoal, and yet the pressure never exceeded 8 lbs. The communication with the reservoir having been closed, the fire doors opened, and the damper shut, the boiler was allowed gradually to cool; and although the tops of the furnaces were depressed, no explosion took place. From this it is evident that steam may be raised to a high temperature, while in contact with water, and yet remain at a low pressure. And this condition can only arise from a deficiency of water in such steam; we may reasonably infer, that if this could by any means be supplied, we should have an almost instantaneous increase of density and pressure proportionate to the degree of saturation. This will fully account for the difference in intensity of many explosions, and why these should so frequently occur immediately after starting the engine, admitting water into the boiler, or lifting the safety valve, all of which tend to produce agitation of the water, and to promote its

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diffusion amongst the steam. Although this theory of boiler explosions, which was advanced by the late Mr. Perkins many years ago, has not hitherto been generally admitted, certainly the facts which have come under my own observation seem fully to confirm its accuracy."

In the course of an interesting speech delivered at the meeting, the chairman stated that he believed it probable that the members of the association alone paid upwards of £200,000 a year for coal, and that a saving of from £10,000 to £20,000 might be effected in a very short time by the application of principles already known. There was by no means a wasteful consumption of coals in his own concern previously to 1838; but in three years from that time, a saving of 1,100 tons was effected as a result of his reading Mr. Charles Wye Williams's Treatise on Combustion. The consumption had been 20 cwt. an hour, upon the average of three years; but after reading Mr. Williams's work, he caused a certain quantity of atmospheric air to be admitted into the furnaces, instead of having coals constantly shovelled in; and upon the average of the next three years, the consumption was only 17 cwt. an hour. He believed there were thousands of firms in this district in whose establishments there was no external supervision, but in which there might be found the same causes of danger that had been detected, and the same wasteful consumption of coal that had been pointed out in the establishments of members of the association.

THE INVENTION OF GROOVED ROLLERS FOR THE MANUFACTURE OF BAR IRON.

BY DAVID MUSHET, ESQ.

(*Continued from page* 535.)

In 1794,* fifteen of the first merchants and bankers of London, including ten members of Parliament, personally esteeming this deeply-outraged man, addressed a letter to Mr. Pitt, which led, not to the exaction from the iron-masters under their contracts of the £11,000 of public money which still remained unpaid of the embezzlements of Mr. Jellicoe, and the release of the patents, but to a grant from the already-defrauded public purse of £200 a year, *as a pension*. Upon this pittance the inventor lingered, watching others amassing the wealth which belonged to him; cheered, doubtless, by some rays of hope that the wheel of iniquity might be at length turned round; for the iron-masters, whose works he superintended after the wanton-destruction of his own, led him on, in order to *secure his instructions*, with the prospect of paying the royalty, until, in 1800, his second patent having expired the previous year, the fatal *lasciate ogni speranza* was stamped upon the fragments of his broken heart, and he died. Sir Anthony Hammond, the Controller of the Navy, most kindly exerted himself (for in such a desert of barbarity the most common-place human feeling is an oasis of kindness) to obtain a pension for his widow, and £125 a year was granted to the relict of the greatest benefactor any country has ever seen, to enable her, in her destitution, to maintain and educate a large family of twelve orphans. Thus this great iniquity rested in creditable silence for eleven years. Under the unrequited services of her murdered husband, the iron-trade rolled on, spreading and increasing like a swollen river. The usurpers of his rights had accumulated profits to at least two millions sterling; numberless establishments, unknown to his æra and to his claims, had sprung into existence; the national savings upon four millions tons of British iron, including two millions and a half of puddled and rolled iron, from 1788 to 1811, are, at a low estimate, £33,976,660; and if we take the intrinsic value of the bar iron alone at £10 per ton, as a value *created* by British labour out of British soil, from materials previously useless, twenty-five millions must be added, or total wealth conferred on his country in 1811, £58,976,660.

Personally acquainted with Mr. Cort's position, and deeply feeling the disgrace of the iron trade swallowing voraciously the whole of such enormous gains, without the slightest acknowledgment to the widow of the man who had been robbed of all, and to whom they owed all, Mr. Robert Thompson, of the Tintern Iron-works, called the attention of the iron trade, in 1811, at a meeting at Gloucester, to their obligations, and the following resolution was then unanimously passed by fifteen firms present:—"That the iron trade was greatly indebted to the late Henry Cort for his exertions in introducing the puddling process to public attention, and for his invention of grooved rollers for the manufacture of bar iron; also that a subscription be forthwith commenced for the relief of his widow, Elizabeth Cort, and her family." Each of the fifteen firms pre-

* Samuel Thornton, M.P., Robert Thornton, M.P., (Russian merchants), John Hunter, M.P., Alderman Curtis, M.P., Alderman Le Mesurier, M.P., Sir George Jackson, Bart., M.P., George Smith, M.P., Robert Smith, M.P., Brook Watson, M.P., Francis Annesley, M.P., Sir Watkin Lewis, William Chute, J. and S. Angerstein, J. Ewer, and J. M. Wilson.

sent subscribed £21, and the contributions of other firms subsequently raised the whole amount to nearly £1,000.

Two of the firms present were Crawshay, Hall, and Bailey, the then partners in the Cyfarthfa Works, and the Penydarran Iron Company, that is, Mr. Samuel Homfray. Each of these subscribed their £21, the same amount as the works of later date, against which Mr. Cort had no special claim, making altogether £42, from the individuals who had been personally instructed by Mr. Cort in his processes, who were the first to profit by them, who remained indebted upon their unpaid contracts of 10*s*. per ton for their use, and who, between he date of those contracts and the date of this liberal subscription, had divided between them not less than half a million sterling of profits by the use of puddling furnaces and grooved rollers.

In the following year, Mr. Coningsby Cort, the inventor's eldest son, strongly conscious of the overpowering claims of his father's descendants upon the national gratitude, for the creation of a mine of internal wealth, which had not only rendered us independent, but enabled us to supply all the world with that which is as much the staff of civilization as bread is the staff of life, had the case brought to the attention of the Prince Regent, who, much impressed, directed Mr. Manners Sutton to move for a Committee to examine the claims of Mr. Cort, to a national recompense. There was abundant precedent for rewarding inventions by parliamentary grants.

At the time Mr. Cort was lingering on his pension of £200 a year, as a substitute for the fortune withheld from him by the Solicitor to the Navy Board, and as his reward for carrying British iron to every market of the globe, John Blake was voted £2,500, to assist him in carrying fish and sprats to the London market by land; £1,300 more than the whole bounty to Mr. Cort for the six years he lived to receive it. In 1801, Thomas Foden was voted £500 for a *paste* to substitute *wheat flour*. There could have been no *protectionists* nor members of the Royal Agricultural Society in Parliament in those days. Up to this time, before and since 1784, about £300,000 has been voted in this sort of way, a great part to reward equally ludicrous schemers *in* and *for* their *failures*. Thus Sir Thomas Lombe was voted £14,000 for copying three engines out of an Italian book, and palming them off upon the legislative benevolence as his own invention. In reading the list of these grants, it might be almost supposed they were based on a principle of charitable commiseration, awarding public money in compassion for the futility and worthlessness of the recipients' acquirements and ideas, were it not that some grants are unexceptionable rewards of meritorious services, such as £30,000 for Dr. Jenner's victory over the dragon of the small pox. During the years when Mr. Cort was perishing, and his widow providing for her twelve children out of £125 a year, at *war prices*, Mr. Palmer, for the invention of mail coaches, was voted £50,000, and £3,000 per annum, which he received for twenty years; total £110,000 — a bounty which might have proceeded *in secula seculorum* but for Cort, as without his rollers we should never have had railways. At any rate, this grant shows the value set by the legislature on improved postal communication, in carrying the letters which Cort's stimulus to commerce had compelled men to write; and some kind of public recompense, in some proportion or other, was naturally expected by the children of the man who, from 1788 to 1811, had saved his country, in foreign purchase, £33,976,660, and created, *within our own shores*, a value of £25,000,000.

A Committee of the House of Commons was accordingly named, in 1812, for this important inquiry, Mr. Davies Gilbert (then Giddy), M.P. for Bodmin, in the chair. The appearance of such a Committee was an untoward event. A searching investigation would have brought to light all the fearful facts I have narrated. It would have appeared that the petitioners had been brought into the position from which they demanded relief by the Solicitor to the Navy suffering a default of £11,000 to remain unsatisfied, a *dead loss to the tax-payers*, whilst he had in his desk quietly locked up patent contracts to the value of £187,500 upon 500,000 tons of iron, manufactured under the patents from 1788 to 1798, not one *shilling of which he had ever claimed from the contracting parties*. Had the patents been renewed for another fourteen years, as was done in Watt and Boulton's case, and *equally deserved* in this, the receipts of Mr. Cort in 1811 (permitted to live) would have reached half a million sterling. I knew, intimately, intimate friends of Mr. Davies Giddy. He was esteemed an amiable, but not a strong-minded man; and the result showed he was unfitted for the stern task of a judicial inquiry, in which, yet more unfortunately, he was the near friend of the principal culprit who came before him, Mr. Samuel Homfray. This man, interested in the result almost to criminality, was the only witness whose evidence was listened to. Since the day when he erected his mill at Pen-y-darran, by the aid of Mr. Cort's drawings, patterns, and workmen, he had sent down the Glamorgan Canal (a means of transit

paid for out of Mr. Cort's suppressed patent dues) 265,946 tons of iron, manufactured by his processes, yielding at a minimum a profit of £1 per ton. He had the year before subscribed at Gloucester to an acknowledgment of the inventor's merits, and had valued his sense of gratitude at £21, which though rather a fractional composition for his unpaid royalties, was at least a pledge. But this Committee was an unexpected difficulty; the results it might lead to were disagreeable, and unexpected means were required for the emergency. Mr. Benjamin Hall, father of the present baronet, and a partner of Crawshay's, had given his evidence entirely and conclusively in favour of the petitioner's claims; also my father's old friend, Mr. Anthony Hill, of Plymouth Works, distinguished for half a century as the most scientific of our leading iron-masters, likewise Mr. Hawkes, of Gateshead, whose signed agreement to pay Mr. Cort ten shillings per ton is now with others lying before me; when, to their astonishment, Mr. Samuel Homfray, whose character was well-known, made his appearance. With an audacity and mendacity quite unparalleled, he roared against everything. He denied that there was a single iron-work in the kingdom using Cort's puddling furnaces, and he denied the originality of his invention of grooved rollers, involving the whole question in a tissue of contradictions, which Mr. Giddy's head appeared quite unable to cope with. A contagious giddiness seized the whole Committee, which comprised *inter alia* the Comptroller of the Navy, the Secretary to the Admiralty, the Secretary to the Treasury, and one of Mr. Richard Crawshay's partners. They seemed alarmed, they closed the inquiry at once, suddenly and prematurely; they did not call Richard Crawshay, who could have told them how he saw "the little mill at Fontley," from which the iron was produced from common ballast, which Dr. Black reported equal in all the trials, and superior in some, to the Swedish Orgrund; how he employed the proprietor of that mill, both before and after his ruin, in erecting a similar mill at Cyfarthfa, feeding him with promises; they did not call Mr. James Cockshutt, his partner, in whose house Cort lived during the erection of the mill and the institution of the processes, and who could have told them, *vivâ voce*, what he stated in writing (but written evidence was not received), "that the plan of that mill had not been much improved since that time; but I believe much imitated;" and that Mr. Homfray was one of those imitators. They in brief gave Mr. Coningsby Cort no opportunity to call counter evidence to meet the surprising *pro re natâ* mendacities of Mr. Homfray, but drew up at once their report, which bears internal evidence of being dictated by him to his friend, Mr. Giddy, setting forth that

"Your Committee have not been able to satisfy themselves that either of the two inventions, one for subjecting cast iron to an operation termed puddling during its conversion to malleable iron, and the other for passing it through fluted or grooved rollers, were so novel in their principle or their application as fairly to entitle the petitioners to a Parliamentary reward.

"That, nevertheless, being convinced that Mr. Cort is fairly entitled to some share of the improvements so extensively beneficial to the country, your Committee entirely approve of the annuity of £200 a year granted to him, and of that of £125 a year extended to his widow; and they would further observe, that the petitioners, viewing the merits of their father through the medium of partial affection, so natural to their situation, seem quite exempt from any charge of presumption in thus soliciting the bounty and liberality of Parliament. Your Committee, therefore, cannot refrain from expressing a hope that the House will deem it right so far to comply with the request of the petitioners, as to bestow on them such a moderate sum as may cover the expenses necessarily incurred during the investigation."

The same House of Commons which received this cruel and impudent false witness, passed a resolution a year or two after, that the guinea which every man could sell in open market for a £1 Bank note and eight silver shillings, was worth no more than one Bank note and one shilling. Such a legislature needed *reform*.

(*To be continued.*)

ON THE ESTABLISHMENT OF CHEAP (PENNY) GYMNASIA.

BY DR. J. LOTSKY.

(*Concluded from page 540.*)

I have been informed that in Clapton and its vicinity alone between six to seven hundred government and merchants' clerks, the higher class of shopkeepers, &c., are residing. Taking things from this point of view, one may safely say, that as soon as gymnasia will have taken hold of the public mind, only so far as the public baths have done now, an at least equal number of gymnasia and baths will coexist. But in such affairs the first step is the most difficult, and my plan is, therefore, one of great humbleness and simplicity.

I suggest that, first, some roomy, decent house be found in one of the localities adjacent to Holborn, Oxford-street, &c. If one with a large yard were to be met with, out-of-door exercises could be also practised, which is yet more beneficial. The inner arrangements ought to be those of any other respectable place of public resort. There ought to be an entrance hall or passage of good size; some minor rooms for repose and rest; and a place where one's garments, cloaks, &c., might be deposited. There ought also to be lavatories, &c. The gymnasium, or place of exercise, ought to be at least from 40 to 60 feet long and 30 to 35 feet broad, lofty, and well lighted. Any two carpenters, a blacksmith, and ropemaker may put up a gymnasium in a week. The class of *teachers* may apparently present a greater difficulty in being properly provided for; but this is not the case, because there is (especially at the present moment) a number of pensioned serjeants and corporals who have acquired a superior knowledge of fencing and drilling, and who would be perfectly competent to attend to a gymnasium. Besides this, a *competent medical* gentleman (*kinesy-therapist*) might give these drill-masters the necessary instructions; and as the number of gymnasia increases, one and the same gentleman might superintend several such establishments, &c. My *Rules and Regulations* for Gymnasia, moreover, will be found a sufficient guidance for the exercises of the young, and all not suffering from any especial ailment or disease.

The *financials*, in fine, of one of the gymnasia for the people is the following:

	per year.
House-rent and taxes . . .	£150
Gas, coals, &c	30
Fitting up of gymnasium, furniture, &c.	100
Fee for inspecting medical officer	30
First drill-master	50
Two assistants at £35 . . .	70
Printing and advertisements, &c.	40
Total per annum . . .	£470

Thus, with the trifling sum of less than £500, a gymnasium could be put up and maintained for one year, while, at the same time, a couple of months would suffice for setting the affair in operation.

Now the working of a popular gymnasium is to be adverted to. The entrance fee must be regulated first at one penny per hour, although I am convinced that in many localities a twopenny, aye, a sixpenny department, would soon have to be added thereto, because the changes and improvements brought on by a systematic and increasing bodily exercise are most wonderful, and have produced in Germany and Sweden quite another set of men. Besides the purely hygeistic (health) bearing of such a gymnasium, there would be a number of parents who wish to have their children out of the way for an hour or two, if they could do so by sending them to a well-conducted place for suitable recreation. To reimburse, therefore, the £500 to be expended during a year, 120,000 pennies are required in the main; but as the fitting up of the gymnasium and furniture of £100 may be duly divided into five yearly instalments, 100,000 pennies yearly will suffice. This would require a daily average attendance of 300 visitors or pupils; apparently a large number, but not so if we divide it amongst, say, ten working hours, which would amount to an attendance of thirty pupils every hour. If those hosts of children are taken into account who crowd our thoroughfares, resorting eagerly to the most puny and strangely-contrived exercises (many a proper object for another Francis de Sales), we are inclined to believe that our 300 gymnasts at one penny an hour will be readily forthcoming.

But a variety of additional schemes and contrivances crowd on my mind. It will, I have no doubt, soon be perceived that at certain times of the day—say from 1 to 3, P.M.—the rooms will be but slightly attended by the regular class of pupils. At such hours the entrance fee might be increased to twopence or threepence, which would increase the income of the gymnasium. If the house should contain suitable rooms, private lessons by the master or assistants might be given in gymnastics, as well as in drilling, fencing, the broad-sword, &c., which are not combating and purely military exercises, but such as have been practised by the mediæval artists of Italy (even Michael Angelo Buonarotti) for imparting to them strength and agility, even for supplying them with pleasing and noble postures, &c. Besides, the English name of Esquire (*armiger*), does certainly not mean one who merely can bear, but one who can also use *arms*, which were worn more generally in the middle ages, and imparted to them a manly, self-confident character.

Although the Greek name of gymnastics may not be yet quite familiar to the masses of the English people, yet bodily exercise is already acknowledged as a necessary ingredient of education. Witness the gymnasia established in the two public parks at London, which, being so far out of the way, can be only considered as flags which the Government has put out for attracting atten-

tion to the subject. In Birmingham, Manchester, Sheffield, &c., regular gymnasia also have been put up in the public parks. Besides, as London is the great attracting point of the world, it possesses a number of most excellent theoretical and practical gymnasts and Kinesytherapists.* Such is Dr. Georgi, a pupil of Ling, formerly sub-director at the Central Gymnastic Institution of Stockholm, upon whose shoulders the mantle of his great master has most undoubtedly descended. He, as well as Dr. Roth, a Hungarian physician, has published various works on medical and educational gymnastics, favourably noticed even in America. The famous water-cure establishment of Malvern has, for years past, embodied gymnastics into its system; and Ehrenhoff, who superintends that department, is also favourably known. Whenever Government will choose to add "*schools of health and strength*" to their system of education, persons of high scientific competency will be found to take the subject into their hands.

But we have to cast a last glance at our favourite *penny* gymnasia for the people. If properly managed, the people's establishments do not require any eleemosynary support. Witness the baths, lodging-houses, &c., which yield even a *high* interest on the capital expended. If a *company* should be established to work fifty gymnasia within a radius of five miles from St. Paul's, they would become the benefactors of their kind, especially now-a-days, when "a healthy person is a *rich* person." But these lines will, we hope, conjointly with an analogous appeal, lately published by a contemporary journal,† urge the affair to a final decision. Let not, O people! we beseech you, let not your children seek for some dark, filthy corner to practise their games and exercises therein. Let us have schools of health and strength, which will be the best preparative for that toil and labour the working classes are now (perhaps too much) subjected to.

As the *Crystal Palace* has been adverted to in the above-mentioned appeal, we perfectly coincide with the idea that this *people's temple* ought to be made educational, improving, *recreating* in every respect. The establishment of a vast gymnasium, well appointed, superintended by a skilled, gentle, considerate, youth-loving medical gentleman, with the assistance of equally tempered drill-sergeants, would add great merit to this gigantic establishment. Besides, the heads of thousands of families would say, "Well, the children will get a day's healthy, invigorating exercise in the Crystal Palace!"

15, Gower-street North, University.

* Kinesytherapy (strength-cure) is a new invention of the Swede Ling, but being a distinct branch of medical science, does not enter into the scope of the present essay.

† The author here refers to an admirable letter on the "Education and Physical Training of Woman," by Mr. W. Bridges Adams, which was published in the *Journal of the Society of Arts*, November 9, 1855.—ED. M. M.

NEW EXPLOSIVE APPARATUS.

THE Major of Engineers, M. Ebner, has laid a report before the Austrian Academy of Sciences, which relates to the solving of the question, "Whether electricity or voltaism is preferable for the exploding of mines in quarries?" &c. The report gives preference to the former, because the amount of effect of the voltaic battery depends on the quality of the conductor through which it has to act; and whenever a great effect (force) is required, the alternative presents itself, either to use colossal batteries, or costly conductors of the usual large dimensions. Electricity, on the contrary, operates in consequence of a mechanic action, without the co-operation of the conductor; and as the resistance does not exist, conductors of cheap material and small power are sufficient. The apparatus adopted now by the Austrian Corps of Engineers, consists of two discs or plates, of 12 inches diameter, and the charge is made without a conductor being employed, by the mere placing of a point between the plates. A smaller apparatus can be carried on a strap on the back of a man. The conductor consists of soft brass wire, of half an inch thickness, and each apparatus is furnished with 2,000 fathoms of plain wire and 400 fathoms of wire coated with gutta percha, and also materials for constructing isolated conductors. The explosive substance, a mixture of sulphur, antimony, and chloride of potash, can be made with ease, and placed in the form of a cartridge at any part of the conducting line. With these apparatuses explosions have been effected at a distance of 1¼ German leagues, and fifty mines exploded simultaneously, on a line of 100 fathoms. Under water explosions were effected at a distance of 400 fathoms, the conductor extending to the length of 500 fathoms. The effects of these machines are independent of seasons and weathers. At the explosions made under water in the Danube, near Grein, and the marble quarries near Neustadt, it has been used for the last two years, without the loss of a single life. According to a signal, the explosion was made when the excavators and others were absent, and bore holes were mostly exploded simultaneously.

The Marine Steam Engine. Designed chiefly for the use of the Officers of Her Majesty's Navy. By Thomas J. Main, M.A., F.R.Ast.S., Mathematical Professor of the Royal Naval College, Portsmouth; and Thomas Brown, Chief Engineer, R.N. attached to the Royal Naval College. *Third Edition.* London: Hebert, Cheapside. 1855.

This work is a successful effort to unite in one volume the theory and practice of the steam engine considered as an instrument, and, we may now add, the principal instrument used for propulsion of ships. Two men, one eminently scientific, and the other, eminently practical, have united their experiences—each willingly imbibing from the other that species of information of which he is complete master—and have produced a work which offers the best solution that has fallen under our notice of the much-vexed question how best to reconcile theory and practice. If men of science and men of practice, instead of indulging feelings of mutual jealousy, and covering one another with ridicule and abuse, would only consent to join hand in hand, and *work together* in the interest of truth, the world would see strides made in material progress of which we do not now venture to dream.

A great portion of the treatise consists of descriptions and explanations of various kinds of marine engines and their gear. The student is introduced in a pleasant and easy manner to a knowledge of all the several parts of which an engine is composed, and the action of each, and what is of great service, the best means of detecting and correcting any errors of adjustment to which they are liable. Practical rules founded on experience are also given for getting up steam, starting the engines, blowing off steam, and the vast variety of practical details of this nature—little, perhaps, in themselves, but of the greatest importance to him who is to work or to superintend the working of steam ships—which we believe fairly exhaust this part of the subject. The scientific portion of the work is equally well handled. The laws of heat, and its effects in the generation of steam, and the various problems which arise in this department of science; the investigation of the mode of measuring the efficiency of an engine (founded on De Pambour's excellent treatise) with practical examples; the theory and mode of action of the paddle-wheel and the screw, are all discussed in easy and simple, but elegant and intelligible language, which none but a writer possessing clear and accurate views of the subject he handles, and an aptitude for imparting his knowledge to others, can employ.

The information sought to be imparted is of a *didactic*, not a controversial nature. Most theoretical writers on the steam engine have been interested in establishing new views or theories of their own, and of course, their whole work has received a complexion from this circumstance. For the purpose of conveying sound and useful knowledge to the *student*, such works are by no means so serviceable as that before us, which seeks to offer its information in a *brief*, as well as soundly scientific manner.

We think the theory of the screw is discussed in a particularly happy and elegant manner. From his investigations on the slip of the screw, Professor Main deduces three propositions, which we do not remember to have seen elsewhere, and which we believe have been fully confirmed by experience. These are, 1. *That the slip is diminished by decreasing the angle of the screw.* 2. *The slip is diminished by increasing the diameter of the screw; and,* 3. *The slip is diminished by increasing the length of the screw.*

There are many other questions discussed in the volume before us, all interesting and well handled, into which we cannot enter. To all who wish to make themselves masters of the construction, uses, management, and theory of the marine steam engine, we heartily recommend this very valuable treatise of Professor Main and Mr. Brown.

ON THE CONSTRUCTION OF IRON SHIPS.

To the Editor of the Mechanics' Magazine.

Sir,—Were we to believe all that is said and written about our failures in gun-making, blunders in ship-building, and the mismanagement in various other departments, we should be compelled to think our energies and mechanical knowledge, for which our country is famed, must be on the decline. There are some men that are never satisfied under any circumstances, and are therefore always repining, because they are allowed to waste away in their solitude; they are also continually giving vent to their wrath, because our Government does not at once take their schemes or inventions under its protection, no matter how unfeasible or extravagant they may be. It has also become quite the rage to depreciate everything, and from the constant "croaking" of a few, who wish to be considered authorities, it has almost become an accepted rule for the public to think that any mechanical or engineering enterprise, no matter what it may be, taken in hand, is sure to result in total failure. I have been partly drawn to make the above remarks, from the views taken by your cor-

respondent, Mr. Clare, on the system adopted in iron ship-building as now practised; he strongly wishes us to conclude that all our knowledge and experience in this branch of science is entirely wrong and false. Let us take the statements, however, as they come, and see how far they agree with existing examples. We will pass over the introductory remarks in his letter, as to what he chooses to term, "iron coffins," &c., and come at once to his ideas on the mechanical and scientific principles involved. Firstly, then, he condemns all the iron ships afloat, up to the present time, saying nothing at all about the principles used. This is certainly a sweeping sentence, but one that he will find difficult to substantiate, or make others believe, seeing the many noble examples we have to the contrary, which are so well known and commented upon that they will not require mentioning here. Secondly, he asks, "Are the people who build iron ships, mechanics?" &c.; and, again, "Are the boiler-makers, and people practising their avocations on iron ships, possessed of a mechanical intellect?" In answer to the first of the above questions, I would state, that those who superintend the construction of such ships are good practical mechanics, and it would be a libel upon the profession to think otherwise. We have only to witness some of our beautiful sea-going iron steam-ships in proof of the statement. As to the fact of their not understanding the rudiments of wood ship-building, I think it will be acknowledged that such is not required by those who merely rivet the plates together; and those whose duty it is to get out the lines, and overlook the general arrangement of the transverse and horizontal beams; or, in other words, who are responsible for the strength and proper distribution of the metal, are men that have previously studied, and have been engaged in wood ship-building, their practical experience being also extensive. For instance, the Messrs. Wilson, of Liverpool, were celebrated wood ship-builders, and having also turned their attention to iron ships, have produced the *Iron Duke*, (steam vessel,) than which there is not a stronger vessel afloat. This is only one instance of many. Again, Mr. Clare's opinion as to the science of iron ship-building being "botched," &c., passes for nothing, seeing the same is not supported by facts, and is totally at variance with all that is known and extensively adopted. No doubt difficulties have been encountered, but iron ship-building is not so small an "infant" as Mr. Clare supposes. Certainly, it might, as he presumes, improve under his direction, and a pity it is he cannot convince others to think the same. As to the "jealous" feeling between iron and wooden ship-builders, Mr. Clare's letter is the only evidence of it. Mr. Clare's advice about the quality of iron in the plates and rivets that ought to be used is, on the whole, a very gratuitous piece of information; but as to its originality, I will say nothing, ship-builders being generally aware of the materials they use in their constructions. We are again told that the "angle iron frame is rendered deficient by the holes punched through the side flange." This is quite true, but due allowance is always made for such deficiencies; the same also applies to the plates. Mr. Clare's remarks about T iron being used for the beams and frames, convince me that he has not examined such constructions very minutely, or he would have seen the form just mentioned, in the iron ship above-named (*Iron Duke*), in which the longitudinal and horizontal beams are nearly all of this kind. I am quite sure the ship-builders of Liverpool and elsewhere will feel greatly indebted to Mr. Clare for his voluntary and concise treatise on the use of water-tight bulk-heads, and to them I will leave the duty of expressing such obligation, and pass on to his views about "iron ships taking ground," &c. He seems to have forgotten the example furnished by the *Great Britain* being ashore so long on the Irish coast, when she was subject to every possible strain and injury, but was, on her removal, after all, found to be affected with little or no damage to her hull. Another example as to the wear in iron ships may be instanced in the *Richard Cobden*, a good sea-going vessel, built about twelve years ago, and now in good condition, having cost comparatively nothing for repairs during that time. Has not Mr. Laird constructed some first-class examples of what is done in this branch of science, in which strength, combined with good material, has been studied? I need not pursue this subject further, as the evidence is so strong against the statements made by your correspondent. One thing I would remark, that judging from the views in Mr. Clare's letter, he is no "prophet" upon ship-building; neither should he send forth such a condemnation of the profession that has done so much for the advancement of this country's interests, simply because his own particular theories differ from those in practice; one thing being certain, that so long as we have no greater evidence than his own, ship-builders will be quite satisfied to rest upon their own experience and practice for the proportions of what Mr. Clare chooses to term "iron coffins." If he will only test the casualties in connection with

the traffic, he will find this term is not appropriate.

I am, Sir, yours respectfully,

ENGINEER.

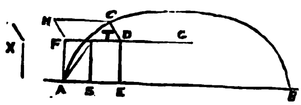
P.S.—I am sorry to trouble you at such length, but I am sure you will grant space to refute incorrect statements.

Manchester, December 10, 1855.

ON THE TRISECTION OF ANGLES.

To the Editor of the Mechanics' Magazine.

SIR,—In the last Number (No. 1686) of your useful Magazine, a correspondent, "Cosmopolitus," inquires for a solution of the well-known problem of the trisection of a plane angle: and he says truly that the ordinary solution resolves itself into another problem, which, no doubt, is as difficult as the original one, and which Professor Barlow asserts (in his article on geometrical analysis in the first volume of the "Encyclopædia Metropolitana," p. 637), cannot be solved by the line and circle. It is, as we all know, in effect the same as the celebrated Delian problem of the duplication of the circle. Now, Sir, I submit that the problem in question can be solved *geometrically* in the strictest sense of the term; in fact, by *plane* geometry. Certain plane curves can be conceived to be generated by the motion of a point according to divers laws: and such curves are, without doubt, *geometrical;* but geometricians have never fully received them into that category unless they could be also described mechanically; so that the two essentials of a geometrical curve are a geometrical conception and a mechanical construction. In fact, the reason why we may say, "from a centre, A, and with a radius, AB, describe a circle," is because what we can do with approximate accuracy, mechanically, we may assume that we can do with perfect accuracy, geometrically. Now mechanically we can describe the curve called the cycloid. Then, upon a line, A B, as that upon which the generating circle rolls, describe any cycloid cutting that line in the points A and B, and through the point A, draw A F at right angles to A B, and make A F = the radius of the generating circle: through F draw F G parallel to A B. Now, let x be the ∠



which it is required to trisect. Through F draw F H, making the ∠ A F H = ∠ x, and from F H cut off F H = A F, and through H draw H C parallel to A B, cutting the curve in the point C; draw C D parallel to F H, and cutting F G in the point D; and through D draw D E at right angles to A B. Then the ∠ C D E = ∠ H F A = ∠ x. Trisect the line A E in the point S, so that A S = ⅓ A E, and through S draw S T at right angles to A B, cutting F G in point T, and with centre T and radius = A F, describe a circle cutting the cycloid in the point V; join T V: then the ∠ V T S = ⅓ x, and is the ∠ required. For A E = the arc of a circle subtended by the ∠ C D E and A S is the arc subtended by ∠ V T S in an equal circle, by the construction of the cycloid; and the angles are as the arcs on which they stand, or

$$\angle x = \angle CDE = 3\angle VTS.$$

In the above construction, which perhaps I have made unnecessarily elaborate, I have assumed that we can trisect a *line*, as the process is too simple to be introduced into the solution. I beg, then, to submit the foregoing to your readers in general, and "Cosmopolitus" in particular, as a strictly geometrical solution of the problem to trisect a plane angle geometrically. Should you consider the above worthy of insertion in your valuable columns, you will greatly oblige, Yours, &c.,

CANTAB.

U. U. C., Dec. 7, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—The following construction is (with your permission) intended as a reply to the invitation of your correspondent "Cosmopolitus."

The trisection of angles, or which amounts to the same thing, the trisection of circular arcs, appears to me to be a very simple problem.

It is obvious that the chord of two thirds of a circular arc may be equal to the radius of the circle, or may be indefinitely small, and that if a chord between these limits is determinate, the chord of the other third of the arc may also be determined. To the description I have added a few equations, to show that it is consistent with a known formula.

I beg leave to say, that I am not acquainted with General Pasley's method.

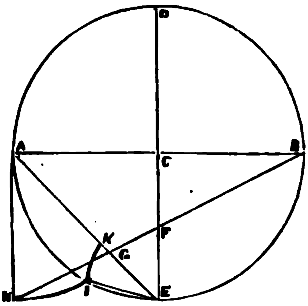
I am, Sir, yours, &c.,

MICROCOSMOS.

December 10, 1856.

Describe a circle A D B E. Draw the diameters AB, D E, making the sector ACE equal to or less than a quadrant. Bisect the radius C E in F, or trisect the chord A E in G. Draw B F G H and A H at right angles to A B. With radius A H de-

scribe the arc H I, meeting the circle in I. With the chord E I for radius describe the arc I K meeting the chord A E in K. Then, if the arc A E = 3 times arc I E,



The arc I E : arc A E : : E F : F D
and : : E G : A E.

If A C = unity, $G K = \frac{I E^3}{3}$

$$\frac{A E}{3} + \frac{I E^3}{3} = E K = I E$$

$$A E + I E^3 = 3 I E$$

$$A E = 3 I E - I E^3$$

a well-known formula for computing the length of the chord A E from the length of the chord I E.

STEAM BOILER EXPLOSIONS:

M. ANDRAUD'S METHOD OF PREVENTING THEM.

To the Editor of the Mechanics' Magazine.

SIR,—M, Andraud having replied, in the French journal, *L'Invention*, of October, to a letter I addressed to you in August last, controverting his theory of steam boiler explosions, permit me to make some further remarks on the subject. In the first place, M. Andraud appears to me to labour under a total misconception of the laws of electricity, — speaking of *resinous* and *vitreous* electricity as two kinds, instead of (as understood by the terms *positive* and *negative*) two *states* or *conditions* of electricity.

Again, referring to my letter, M. Andraud remarks, "It is said that the experiments of Professor Faraday prove that electricity is not formed in the steam, but is *produced* by the friction of *molecules of steam*," &c. I beg to say that I made no such remark—the terms "*evolved*," "*excited*," "*globules of water*," having a very different application.

M. Andraud's assertion that he is supported in his opinion by Professor Faraday, because the experiments of the latter "demonstrate the existence of electricity in the mass of steam, either latent or otherwise," is simply absurd. Of course, electricity is present, as it is present everywhere in everything, and requires only disturbing influences to make it manifest. M. Andraud presupposes impossible conditions—a boiler never being in a state of perfect insulation. I again repeat, contrary to M. Andraud's assertion, that it is utterly impossible for *free* positive and negative electricity to exist at the same time in any conducting medium, particularly so good a conductor as steam, either in a dry or moist state.

The theory of currents, as mentioned by Mr. Mushet, is far more feasible, supported as it is by an experiment of Mr. Perkins, who found that when a cock was inserted in the bottom of a boiler, water would not be ejected under circumstances secondary to the state of suspension spoken of by Mr. C. W. Williams, in which the water would enter the spheroidal state. Such being the case, it is easy to foresee the consequences which must result from any disturbing mechanical influences—either the introduction of fresh water to the boiler or the sudden escape of steam, the conditions under which the explosions of boilers invariably take place.

I am, Sir, yours, &c.,
E. W. F.

P.S.—I quite agree with M. Andraud that his conducting rods can do no harm; but I think engineers will be slow to adopt them upon that recommendation only, and I can see no other.

Clerkenwell, Dec. 10, 1855.

BOYDELL'S TRACTION ENGINE.

To the Editor of the Mechanics' Magazine.

SIR,—Finding a letter in your publication of this morning, from Mr. Pinchbeck (who is a stranger to me), in which he expresses astonishment at my remarks as to what took place at the Royal Agricultural Society's meeting at Carlisle, relative to my traction engine, I shall be much obliged to you to insert this in reply to it:

If Mr. Pinchbeck will read my letter again, he will find I have not noticed anything that passed at Carlisle, but merely alluded to a model made by Mr. Amos, and shown, I find, for the purpose of disproving my assertion with regard to the power I say is gained by working the pinion in the position mine was placed in in the experimental traction engine; and that model, I repeat, instead of disproving that assertion, completely proves it. And here, as you say in a former number that you cannot attach any meaning to my saying the upper weight acts twice as powerfully as the lower one, I

will endeavour to make that meaning clear. In Mr. Amos's model, the weights representing the power have each a tendency to move the carriage the same way, although placed to move it in opposite directions; the pressure on the pulley and pull at the wheel from the lower side are equal to the backward action of the pulley taken from the forward one of the wheel by the pull from the upper side.

I conclude all will admit, if a rope be wound round a wheel of a carriage, and a horse be fastened to that rope, and pulls it from the top of the wheel, he will have twice as much power as if he pulled from the axle, and travel double the distance the carriage does, until the rope is unwound; but if that same horse rode upon the body of the carriage, and it were long enough for him to travel to unwind the rope, he would only walk the same distance as the carriage moved—the carriage taking him an equal distance which would make up that gone on the road; and the power exerted by the horse would be the same, the only difference being, that the load would be heavier in the one case by the weight of the horse.

Your correspondent says he considers the attempt to plough at Carlisle a total failure. In justice to myself I must say, that I did not profess to have made an engine perfect for ploughing, and exhibited mine to convince engineers and others that, upon the principle of my endless railway, ploughing might be satisfactorily and cheaply done by steam. And so far I succeeded; for with the engine, imperfect as it was, in very wet weather, two ploughs were drawn the length of the field both ways on the first day of trial, and on the second, six were drawn *one way, and four the other;* and four of these six were held by Messrs. Ransome's ploughmen, and to them and others I can refer your correspondent, if he did not see this done.

I will not occupy any more of your valuable space further than to say that, as engines are now building upon a better construction than the experimental one, I hope soon to show that ploughing can be done by steam power, at one-half the cost of horses, upon all moderately level land.

I am, Sir, yours, &c.,

JAMES BOYDELL.

Camden Works, Camden-town,
Dec. 8, 1855.

SUPERHEATING STEAM.

To the Editor of the Mechanics' Magazine.

SIR,—Can any of your readers aid me in the following:—Steam is required at from 550° to 650° Fahr. At what pressure would this require to leave the boiler to pass through a series of iron pipes at a red heat? What size and length would these require, the opening of the tap thereto being equal to 1 inch square?

Engineers widely differ, and I am desirous of avoiding accident and uncertainty.

I am, Sir, yours, &c.,

HENRY SHERMAN.

Dec. 8, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

THIERS, RODOLPHE, of Lyons, France. *A machine for manufacturing stretchers of umbrellas and parasols.* Patent dated May 4, 1855. (No. 996.)

The machine described by the inventor is so constructed as to seize the iron wire at the bundle, straighten, cut, and fork it, by a series of successive operations gone through in one revolution of the wheel of the engine.

FRONTIN, JEAN PECHORIS DE, of Agen, France. *The use of a new material in the manufacture of paper and pasteboard.* Patent dated May 4, 1855. (No. 997.)

The inventor proposes to employ in the manufacture of paper, 1st. The Acacia tree. 2. The various kinds of the annual plant called lupine. 3. The plant called bryonia, the stalks of which are used, and also the roots after the amylaceous matter has been extracted, (the latter may be applied in any suitable way to sizing the paper in the pulp or afterwards). 4. The stalks of the bulbous plant, called Jerusalem artichoke, and the residue of the bulbs of said plant, after the saccharine matter has been extracted therefrom. 5. The stalks of sunflowers.

LACASSAGNE, JOSEPH, and RODOLPHE THIERS, of Lyons, France. *An electrometric regulator for electric telegraphing, lighting, and electro-motive purposes.* Patent dated May 4, 1855. (No. 998.)

This invention relates to an apparatus for rendering electric currents regular and constant whatever may be the variation in the battery employed; also for regulating the intensity of the current to any extent required, and for indicating the amount of dynamical electricity expended upon any kind of work. We may give a description of it hereafter.

HAMILTON, JOHN, junior, of James-street, Liverpool. *Improvements in the construction of iron girders.* Patent dated May 4, 1855. (No. 999.)

In this invention a series of corrugated sheets of iron are used in constructing the upper part of a girder, fastened together and kept at a distance apart and parallel to each other by transverse partitions of wood or iron, with undulations to correspond with and fit the corrugations of the sheets.

DALTON, DANIEL, of Chester, ironmaster. *Improvements in furnaces for the smelting iron ore and iron stone, and other stones and ores.* Patent dated May 4, 1855. (No. 1000.)

In this invention the chamber of the furnace is to be built with a feed mouth at top, similar to a blast furnace, and at the lower part this chamber is formed hollow to receive as it descends the metal which is tapped from this lower part. The furnace has at one or more sides a fire-place, the heat and products from which pass towards the chamber of the furnace in which the ore is placed.

MIDGLEY, ROBERT, of Salterlee-mill, Halifax, York, and GEORGE COLLIER, of Halifax. *Improvements in preparing yarns for weaving and other purposes.* Patent dated May 5, 1855. (No. 1002.)

The inventors support the yarns in hanks upon pairs of pulleys or rollers carried by lever arms or frames, by which they are capable of being borne against a revolving heated cylinder, the rotation of which gives motion to the yarns whilst the heat of it dries them.

BEAUMONT, JOSEPH, of Elland, Halifax, York, miller. *Improvements in treating wheat meal obtained in the manufacture of flour.* Patent dated May 5, 1855. (No. 1003.)

These improvements relate to the application of heat to the meal in its transit from the grinding apparatus to the sieves for separating the bran or pollard from the flour, in order to drive off the moisture contained therein.

BRANDON, ALEXANDER, of Paris, France, gentleman. *Improvements in heating and warming apparatus.* Patent dated May 5, 1855. (No. 1004.)

Claim.—The heating and warming by means of water or other fluid caused to circulate through a chamber, heated by a lamp or otherwise, and to impart heat, either directly to a volume of water, liquid, or fluid, or to impart heat to such volume of water, liquid, or fluid, by circulating through a casing surrounding the same.

BUTCHER, MATTHEW, of Birmingham, Warwick, manufacturer, and THOMAS HENRY NEWEY, of Birmingham, machinist. *Improvements in forge-hammers.* Patent dated May 5, 1855. (No. 1006.)

This invention consists in making the brays and chairs in which the fulcrum of forge-hammers moves adjustible; in constructing and fastening anvils on the heads of forge-hammers; in the use of moveable metal washers for receiving the percussive action in the brays and chairs of forge-hammers where they are adjustible, and thereby preventing injury to the adjusting screws; and in the use of washers of vulcanized caoutchouc and wood under the chairs of forge-hammers, for the purpose of diminishing the action of the hammers thereon.

ROBERTS, SAMUEL, of Hull, smith. *Improvements in steam engines.* Patent dated May 5, 1855. (No. 1007.)

In this invention the steam cylinder is made longer than is required ordinarily, and two pistons are employed, each of which is moved to and fro within the cylinder a distance somewhat less than half the length of the steam cylinder. The two pistons are connected together by a plate or frame, having in it a slot to receive a wheel placed on the crank pin, so that by the reciprocating movements of the pistons motion is given to the crank which is within the cylinder. The shaft or axis passes through the cylinder, at each end of which steam ports are formed.

PECOUL, HENRI GUSTAVE ADRIEN, civil engineer, of Rue de l'Echiquier, Paris. *A new mode of generating power in steam engines.* Patent dated May 5, 1855. (No. 1008.)

In this invention ether is converted into vapour in a cylinder, by means of spiral copper tubes, about two-thirds of an inch in diameter, coiled round three or four times according to circumstances. These tubes are fixed to each end of the cylinder, and are made of the requisite strength. A current of steam passes through the spiral tube from the boiler placed separate from or underneath the cylinder.

BROADBENT, ROBERT, of Stalybridge, Chester, machine maker, and SQUIRE FARRON and BENJAMIN GRUNDY, of Ashton, Lancaster, engineers. *Certain improvements in steam engines.* Patent dated May 7, 1855. (No. 1009.)

Claim.—An improved combination of machinery "for working the slide valves of steam engines in such wise that the amount of opening for the admission of steam, and the time of cutting off the steam, may be regulated independently of each other."

PEARSON, JAMES, of Pyle-house, Totterdown, near Bristol, Somerset, civil engineer. *Improvements in the method of fastening tires on wheels.* Patent dated May 7, 1855. (No. 1010.)

In this invention a recess is turned in an internally projecting part of the wheel-rim, on the side opposite to the flange. The rim is provided with a projection of a shape corresponding with that of the recess, into which it is inserted by pressing the tyre over the wheel-rim in a state of red heat; this being done, a projecting ledge is hammered down over the edge of the wheel-rim. Other methods are also described.

FOXWELL, DANIEL, of Manchester, Lan-

caster, card manufacturer. *Improvements in machinery or apparatus for making wire cards, and in the manufacture thereof.* Patent dated May 7, 1855. (No. 1012.)

This invention consists in making sheet cards in a vertical position, and in putting the wires through the foundation in an oblique position instead of at right angles.

TYZACK, EBENEZER, of Abbey Dale Works, Sheffield. *An improvement in scythes.* Patent dated May 7, 1855. (No. 1014.)

This improvement consists in simply making that part of the strengthening rib or scythe back which enters the turned-over part of the blade flush and taper, and in forming the edge of the turned-over part of the blade with a bevilled edge, so as to require no shoulder on that part of the scythe back.

HANDS, JOHNSON, of Epsom, Surrey. *Improvements in boiler and other furnaces and flues.* Patent dated May 7, 1855. (No. 1016.)

In this invention furnaces are "constructed with flues at the sides or top or both with partitions which separate the furnaces from the flues. These flues are perforated with slits or narrow holes. The flues leading from the furnaces are constructed and arranged of considerable length before they join the flues first mentioned which are outside the furnaces, the products of combustion from the furnaces pass on therefrom into the flues connected therewith and circulate therein, the heat being used to heat the boilers or otherwise; and after the products of combustion from the furnaces have circulated in the flues connected with the furnaces they come back and pass through the flues formed at the sides or over the fires, and consequently the products pass against or over the perforated partitions and thence into the chimneys. In the flues leading from the furnaces to the chimneys there are openings (with doors) to admit air."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in hair and other pins, used as dress or ornament fastenings.* (A communication.) Patent dated May 7, 1855. (No. 1019.)

Claims.—1. The use of hair pins or pins for dress fastenings formed with undulations on their shanks before described. 2. The use of pins having projections or irregularities formed on the surface of their shanks. 3. A mode of undulating the shanks of pins by means of undulated dies and matrices.

LEWIS, JAMES, of Holborn, London, manufacturer of refined soaps. *An improved soap.* Patent dated May 7, 1855. (No. 1022.)

Claim.—The manufacture of an improved soap by combining with the materials ordinarily used in the manufacture of soap, iodine in any of its forms.

WILTON, WILLIAM BURTT, of Lowestoft, Suffolk, engineer. *Improvements in furnaces for steam engines.* Patent dated May 8, 1855. (No. 1023.)

Claim.—Constructing the furnaces of steam engines with hollow malleable fire bars, and with air tubes for the admission of atmospheric air; also, doors to check the fire instead of opening the furnace doors, and an arrangement of bearing bars, dead and bridge plates, and ash pit door.

MINIÉ, CHARLES CLAUDE ETIENNE, of Paris, France. *Improvements in muskets or portable fire-arms.* Patent dated May 8, 1855. (No 1024.)

The inventor describes a fire-arm in which is employed a combination of a rod acted upon by a spring with a certain hook connected with the trigger, of which we may give a fuller description hereafter.

HUGHES, JOSEPH, of White Hall Mills, Chapel-en-le-Frith, Derby, paper manufacturer. *Improvements in the manufacture of paper.* Patent dated May 8, 1855. (No. 1025.)

Claims.—1. The use of sulphate of alumina instead of the alum of commerce in the manufacture of paper. 2. The use of the precipitated sulphate of barytes for the same purpose. 3. The use of the precipitated sulphate of barytes and alumina.

FOXWELL, DANIEL, of Manchester, Lancaster, card-manufacturer. *Improvements in sewing machines.* Patent dated May 8, 1855. (No. 1026.)

This invention consists in the use of perforated plates or rods for the threads to pass through—in the use of a spring to overcome the back-lash of the crank—in fixing the vertical needle to the head of a pin or spindle working in a socket—in the use of a lever acted upon by a cam and spring to press against the vertical needle—in the use of a strong spring acting upon the cranked segment, &c.

LINGARD, THOMAS TAYLOR, of Manchester, Lancaster, engineer. *Certain improvements in presses, which improvements are also applicable to raising heavy bodies.* Patent dated May 8, 1855. (No. 1027.)

This invention consists of arrangements "in which two or more inclined planes are placed underneath a table, in such manner that by moving two or three wedges or rollers in the direction of the length of the incline planes the table will be forced upwards."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for the manufacture of paper tubes to be employed in connection with spinning-machinery.* (A communication.) Patent dated May 8, 1855. (No. 1029.)

In manufacturing cop tubes according to this invention, a long strip of paper is wound on to a bobbin or other suitable holder. The free end of this strip is passed along a guiding table, under a gumming roller, and thence between a pair of feeding rollers which supply the paper-cutting and tube-rolling mechanism.

WILLIAMS, JOHN ALLIN, of Baydon, Wilts, farmer. *Improvements in machinery or apparatus for driving or actuating ploughs and other implements employed in working and cultivating land.* Patent dated May 8, 1855. (No. 1030.)

These improvements "consist in the employment of a hauling machine fitted with a pair of windlasses or winding drums which are driven by steam power at a slow speed by an ordinary agricultural engine."

BOWRON, JAMES, of the Tyne and Tees Glass Works, South Shields. *An improvement in the manufacture of glass tiles.* Patent dated May 8, 1855. (No. 1031.)

Claim.—The manufacture of glass tiles by pressing them from fluid glass, instead of first making the glass into sheets and then shaping it.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved construction of air-engine.* (A communication.) Patent dated May 8, 1855. (No. 1033.)

This is another air-engine by Captain Ericsson. In it the air is admitted under atmospheric pressure while the supply piston is moving from the working piston as the previous charge of heating air is exhausting, so that the supply piston moves in equilibrio, or nearly so, and the supply air is finally compressed and then transferred to the regenerator and heater, or to either, as the supply piston moves between the supply air and heated air while the working piston is nearly stationary.

IMBS, JULES JOSEPH, merchant, of Brumath, French Empire. *Certain improvements in manufacturing cartridges or cases for containing charges for fire-arms.* (A communication.) Patent dated May 8, 1855. (No. 1034.)

This invention consists in manufacturing cartridges or cartridge cases from a cloth made of floss, silk waste, &c.

WILLIAMS, THOMAS, of Red Lion-street, Clerkenwell, Middlesex, tool-manufacturer, and JOHN HOBSON FULLER, of New Brentford, Middlesex, gentleman. *Improvements in wrenches, pliers, and spanners.* Patent dated May 8, 1855. (No. 1035.)

This invention consists in adapting to wrenches, pliers, and spanners adjusting mechanism composed of screws, springs and wedges.

BOWLEY, ROBERT KANZOW, of Charing-cross, Middlesex, bootmaker. *Improvements in boots and shoes, and other coverings for the human foot.* Patent dated May 9, 1855. (No. 1036.)

This invention consists in the use of an inner sole of felt or other similar fabric in lieu of leather, when the same is so connected with the upper leather and outer sole as to form a component part of the boot or shoe.

WORRALL, JOHN MAYO, of Salford, Lancaster, dyer and finisher. *Certain improvements in machinery or apparatus for cutting piled goods or fabrics.* Patent dated May 9, 1855. (No. 1041.)

Claim.—The use of an indented or recessed blade or straight edge, to be used in place of the ordinary straight edge of the bed-plate in machines for cutting piled fabrics, for the purpose of producing (with the aid of the ordinary revolving spiral cutters or knives,) a pattern or design in the face of such fabrics in the direction of the warp.

WORRALL, JOHN MAYO, of Salford, Lancaster, dyer and finisher. *Certain improvements in machinery or apparatus for cutting piled goods or fabrics.* Patent dated May 9, 1855. (No. 1042.)

Claim.—The use of cylinders, rollers, or drums in machines for cutting piled fabrics, for the purpose of producing (with the aid of the ordinary revolving spiral cutters or knives,) patterns or designs on such fabrics, the cylinders, rollers, or drums being so constructed or arranged as to produce a design on the fabric, either transversely and in the direction of the weft, or longitudinally, and in the direction of the warp.

MARKINDALE, RICHARD SHIERS, of Salford, Lancaster, worsted spinner. *An improved method of removing wool from sheep-skins and other peltry.* Patent dated May 9, 1855. (No. 1043.)

Claim.—The use of artificial heat, to be applied to "tainting stoves," or to any similar buildings employed for the purpose named in the title.

MORRISON, DUNCAN, of Bordesley Works, Birmingham, Warwick. *Improvements in the manufacture of metallic bedsteads, sofas, and other articles to sit or recline on.* Patent dated May 9, 1855. (No. 1044.)

Claims.—1. Making metallic bedsteads with lathes having inclined and notched projections inserted in slots or holes. 2. Making the joints of metallic bedsteads by uniting the ends by casting. 3. Making and fixing the dovetail joints as described. 4. Making the dovetail joints of cast malleable iron.

TAYLOR, GEORGE, of Liverpool, Lancaster, merchant. *Improvements in steam engine governors.* (A communication.) Patent dated May 9, 1855. (No. 1045.)

This invention consists in the combined arrangements of one or two bars or shafts "loaded on each of the ends with equal weight for resisting centrifugal force, and transversely fixed, oscillating upon a single centre in the slot or device of a driving spindle, and a spring or springs so adjusted as to resist the centrifugal force."

LISTER, SAMUEL CUNLIFFE, of Bradford, York, manufacturer. *Improvements in treating old ropes, also old canvas and gunny bags, and similar materials, parts of which improvements are also applicable to hemp, flax, rhea, and other similar fibre, to render parts of the fibres suitable to be spun.* Patent dated May 9, 1855. (No. 1046.)

These improvements consist in passing the substances through rollers, and in opening and tearing in pieces their ends as they come through the rollers, by means of a spiked drum. In front of the rollers is placed a cutter, which cuts off the ends in suitable lengths, after which they are passed to a carding engine.

GRAINICHER, SAMUEL, of Zofingen, Switzerland. *Certain improvements in the construction of pumps, parts of which improvements are also applicable to steam engines.* (A communication.) Patent dated May 9, 1855. (No. 1048.)

This invention consists in the use in semi-rotary pumps and steam engines of certain packings, in combination with inclined planes, by which the packings are pressed home.

MERTENS, CHARLES, of Gheel, Belgium. *Improvements in breaking and scutching flax, hemp, and other fibrous matters, and in the machinery employed therein.* Patent dated May 10, 1855. (No. 1049.)

The inventor describes a combination of machinery whereby the flax or fibrous material is held and carried through the machine, and scutched or beaten by beaters, and is also conducted when desired into a second machine.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved mode of preparing colours for printing and staining fabrics.* (A communication.) Patent dated May 10, 1855. (No. 1053.)

Claim.—The use of liquid uncoagulated caoutchouc as a vehicle for the application of colouring matter, and the means of rendering it more or less liquid.

ALLEN, MATTHEW, of Worship-street, Middlesex, builder. *An improved valve, particularly applicable for regulating the supply of air to furnaces and fire-places.* Patent dated May 10, 1855. (No. 1054.)

An illustrated description of this invention was published at page 460 of our current volume (No. 1684.)

NORTON, FREDERICK WILLIAM, of Edinburgh, North Britain, manufacturer. *Improvements in the manufacture or production of figured pile fabrics.* Patent dated May 10, 1855. (No. 1056.)

Claims. — 1. Certain modes of weaving printed warps for the production of a double printed pile or velvet fabric, to be divided into two separate single fabrics after having been woven. 2. A mode of so arranging the beams of the ground warps that the two cloths shall be kept the requisite distance asunder during the weaving, and, when cut, shall each have its requisite length of pile. 3. A mode of weaving double-printed pile or velvet fabrics, wherein two or more sets of printed warp threads are woven in alternately, so that each set of threads is only worked into the fabrics at intervals, and so that the pattern upon each set only requires to be elongated to about the same extent that would be necessary were a single set of threads used.

HARRIS, JOHN, of Woodside, near Darlington, civil engineer, and THOMAS SUMMERSON, of West Auckland, near Darlington, ironfounder. *An improvement in the manufacture of iron railway-wheels.* Patent dated May 10, 1855. (No. 1057.)

This improvement consists in "employing a ring of wrought-iron, which is placed in the mould, to receive the casting of iron thereon."

HUNT, CHARLES JARED, of the Willows, Mitcham, Surrey. *Improvements in tug and other hooks.* Patent dated May 10, 1855. (No. 1058.)

The inventor forms a hook of three parts, hinged or pin-jointed together; namely, a stem made with a swivel-eye, or otherwise, as may be desired; a second part which receives the strain, and which is connected by a pin joint to the stem; and a third part jointed at one end to the second part, and having the other end made so as to be securely held to the stem of the hook, by means of a cylinder, which is capable of rotating near the upper part of the stem, so as to retain or loose the point of the hook.

HALLAM, JOSEPH, of Sheffield, York, needle-manufacturer, and JOHN ELCE, of Manchester, machinist. *Improvements in the construction of rowels or toothed cylinders for self-acting temples and other purposes.* Patent dated May 11, 1855. (No. 1059.)

This invention consists in fixing the teeth or pins of rowels or toothed cylinders into metal shells, and in afterwards fixing these shells in an arbor or shaft.

HUMPHRIES, EDWARD, of Pershore, Worcester, machinist, and THOMAS HUMPHRIES, of the same place, machinist. *Improvements in machine riddles for separating straw from grain, and for other similar pur-*

poses. Patent dated May 11, 1855. (No. 1060.)

This invention consists in constructing machine riddles with the perforations inclined.

Johnson, John Henry, of Lincoln's-inn-fields, gentleman. *Improvements in the manufacture of sulphuric acid.* (A communication.) Patent dated May 11, 1855. (No. 1062.)

In carrying out this invention two processes are employed: "The first has for its object the production of sulphurous acid by one or other of the analytical or synthetical reactions which will produce this gas to be afterwards oxydized; and the second process serves to destroy or decompose this sulphurous acid by the aid of sulphuretted hydrogen and steam."

Henderson, Constantine, of Tuffnell-park, Middlesex, gentleman. *Improvements in the construction and arrangement of locks.* Patent dated May 11, 1855. (No. 1063.)

These improvements consist in adapting to the outside of the face plate of locks a species of auxiliary lock which requires to be first opened before the key hole of the main lock can be entered by the key, and which consists of concentric split rings which work round the pin of the lock in the spaces between the concentric wards.

Pascall, Joseph, of Chislehurst, Kent, manufacturer, and George Fry, of Lee, same county, gardener. *Improvements in blanching, forcing, and propagating garden-pots.* Patent dated May 11, 1854. (No. 1064.

Claims—1. The constructing of pots for the blanching of sea-kale, &c., in two separate parts, the bottom part being formed with a groove or channel in or around its upper part, into which is fitted the edge of the upper part. 2. The constructing or forming pots or pans with a groove or channel on the top edge thereof for the reception of a cover of some opaque ware, or of a glass cover or shade. 3. The forming of the ordinary hole in the bottom of garden pots only partially through the bottom, and causing apertures or channels to radiate therefrom to the outside of the pot.

Steele, James, of Greenock, Renfrew, sugar-refiner. *Improvements in effecting the drainage of moulded sugar.* Patent dated May 11, 1855. (No. 1065.)

In this invention, the drainage pins are all entered into the moulds prior to the deposition therein of the fluid sugar. The pins have broad heads or flange pieces, carrying cloth or elastic washers to fit up against the mould aperture, to prevent waste. When the drainage is to commence, the pins are withdrawn, and the drainage aperture left moulded, as it were, in the sugar.

Sanders, Frederick George, of the Patent Architectural Pottery, Poole, Dorset. *Improvements in brick, pipe, and tile machines.* Patent dated May 12, 1855. (No. 1069.)

Claims.—1. The construction of brick, pipe, and tile machines, wherein screws are fitted at either end, for the purpose of forcing the plastic materials in opposite directions. 2. The application of knives, either to double or single shafts, for the purpose of mixing and forcing clay through the die or lateral openings, or for pugging.

Robinson, George, of Manchester, Lancaster, machine-broker. *An improved invalid's bed.* Patent dated May 12, 1855. (No. 1070.)

Claims.—1. Certain apparatus for raising and lowering the patient in a horizontal position. 2. Certain apparatus for raising and lowering the upper part of the body. 3. Certain apparatus for keeping a fractured limb in a fixed position.

Herdman, John, of Belfast, Antrim, Ireland. *Improvements in the manufacture of wrought-iron plates, adapted for ship-building and other purposes, for which strength and lightness are required.* Patent dated May 12, 1855. (No. 1071.)

The inventor manufactures wrought-iron plates by welding together the projections of two plates, each of which has one plain side, and one side with projections of any suitable form upon it.

Adams, William Bridges, of Adam-street, Adelphi, Middlesex, engineer. *Improvements in the construction and propulsion of vessels for navigation, moved by internal power.* Patent dated May 12, 1855. (No. 1072.)

A full description of this invention will be given hereafter.

Whyatt, George, of Openshaw, Lancaster, dyer. *Certain improvements in machinery or apparatus for cutting piled goods or fabrics.* Patent dated May 12, 1855. (No. 1074.)

This invention consists in causing the circular or spiral revolving knives or cutters to be alternately raised or depressed, in order that the cutting shears shall only operate at intervals on the piled fabric for the purpose of effecting a stripe or pattern, by cutting the pile shorter.

Fontainemoreau, Peter Armand Lecomte de, of South-street, London. *Improvements in machinery for boring or perforating stone and other materials.* (A communication.) Patent dated May 12, 1855. (No. 1076.)

This invention mainly consists in a mode of forming pipes by placing the substance to be bored in suitable frames or cases, "so that, when in motion, the weight of the material rests upon fixed drills or bits."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Balestrino, Henri Marquis de, of Genoa. *Improvements in obtaining motive power by the aid of explosive gases.* (A communication.) Application dated May 7, 1855. (No. 1011.)

The inventor inserts alternately at each end of a cylinder containing a piston a small quantity of mixed gases, and explodes the same by means of a current of electricity from a galvanic battery.

Price, Enoch, of Bute Docks, Cardiff. *Improvements in daylight reflectors.* Application dated May 7, 1855. (No. 1013.)

The inventor constructs his improved reflectors of small pieces of glass of various shapes and patterns to suit particular designs, but of the uniform size of sixteen square inches, or one-ninth of a square foot, or thereabouts. These pieces are bedded in any suitable cement spread upon a frame, and the spaces between painted according to fancy or design.

Clark, Robert, of Gallowgate, Glasgow. *Improvements in obtaining elastic finish to piece goods.* Application dated May 7, 1855. (No. 1015.)

This invention has for its object an improved combination of mechanical parts into a machine for obtaining elastic finish to piece goods, the principal feature of the machine being two endless bands, with points which are kept parallel by rods or bars at intervals which allow of the endless bands to move to and fro independently of each other as they circulate through the machine, but at the same time keep them at all times parallel.

Bazley, Thomas, of Manchester, Lancaster, cotton-spinner. *Improvements in the construction and arrangement of creels used in machines for winding, reeling, and doubling fibrous yarns or threads.* Application dated May 7, 1855. (No. 1017.)

This invention consists in interposing apparatus at a point between the cop and the rollers, bobbins, or reels—such as a screwed wire, around which the yarn or thread is wound, or a series of pins, or a comb arrangement—between and against which the yarn or thread is made to pass in going from the cops to the rollers, bobbins, or reel.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of paper and card-board.* (A communication.) Application dated May 7, 1855. (No. 1018.)

This invention consists "in producing paper and cardboard from the pulp and other portions of waste or spent beetroot."

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the consumption or prevention of smoke.* (A communication.) Application dated May 7, 1855. (No. 1020.)

These improvements "consist in placing an auxiliary grate immediately behind the bridge of the furnace, which is fed separately by a lateral door with coke, and is in direct communication from below with the main furnace, the products of combustion from which must pass through the incandescent fuel by entering from the underside of and passing through the auxiliary grate before entering the flue."

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in cocks and valves.* (A communication.) Application dated May 7, 1855. (No. 1021.)

This invention relates to an "improved mode of forming cocks and valves generally, and of forming the junctions connected therewith, and consists in the employment for that purpose of metallic rings which may be either fixed or moveable."

Needham, Richard, of Hollinwood, Lancaster, engineer. *An improved apparatus applicable to steam boilers, for the purpose of economizing fuel, and also assisting in the generation of steam.* Application dated May 8, 1855. (No. 1028.)

The invention consists in the arrangement and combination of two cylinders, one within the other, so constructed that while the lesser one forms a flue, a space is left between the two for the free circulation of the feed water, which is heated by "the residual heat and gases" which are passed through the inner cylinder.

Hallewell, Benjamin, of Leeds, York, wine-merchant. *Improvements in drying grain which has not been subjected to the process of malting.* Application dated May 8, 1855. (No. 1032.)

The grain is placed on perforated floors under which is arranged a series of gas tubes with burners, and also pipes through which steam circulates.

Gedge, John, of Wellington-street South, Middlesex. *An apparatus for cleansing rooms or other spaces.* (A communication.) Application dated May 9, 1855. (No. 1037.)

This apparatus has on one side a brush, and on the other an absorber consisting of a back of metal, three cylinders and a roller of wood, a piece of woollen stuff, and a metallic receiver.

Gedge, John, of Wellington-street South, Middlesex. *Improvements in the manufacture of woven or textile fabrics.* (A communication.) Application dated May 9, 1855. (No. 1038.)

The patentee proposes to employ in making a fabric threads, which he introduces into the warp or woof, and which, being destroyed during the process of cleansing the fabric by substances used for

that purpose, will leave vacancies which will represent drawn threads.

Gedge, John, of Wellington-street South, Middlesex. *Improvements in cases for spectacles and similar articles.* (A communication.) Application dated May 9, 1855. (No. 1039.)

This invention consists in forming the inner portion of the case in the exact form of the spectacles to be placed therein.

Cockey, Edward, Henry Cockey, and Francis Christopher Cockey, of the Frome Iron-foundry, Somerset, engineers. *Improvements in clod-crushers and land-rollers.* Application dated May 9, 1855. (No. 1040.)

The clod-crushing or levelling portion of the improved implement is composed of cylinders, of a corrugated form, or having projecting rings cast on their surfaces. The scraper may be made either to correspond with the corrugations or rings, or to suit any wheel clod-crusher, or with a straight edge for a plain cylinder roller.

Whipple, Cullen, of the United States of America. *Preparing and combing wool.* Application dated May 9, 1855. (No. 1047.)

By the arrangement described by the inventor the wool is prevented from leaving the teeth on the cylinder into which it is first fed till after it has been combed.

Lewis, John William, of Granby-road, Manchester, manufacturer of lightning conductors. *Improvements in lightning conductors.* Application dated May 10, 1855. (No. 1050.)

This invention consists in the employment of a flat copper-wire rope formed of three or more strands, each strand composed of two or more wires.

Scott, William, of Birmingham, Warwick, gun-maker, and Alfred Powell, of the same place, engineer. *Improvements in apparatus or machinery to be employed for the purpose of rifling and draw-boring gun-barrels and ordnance.* Application dated May 10, 1855. (No. 1052.)

The improved machinery consists of a steam cylinder, having an internal worm and a piston on which is formed a thread or pin working into this worm. To the piston rod is fixed a cutter, and on the admission of steam the piston travels in the worm and the cutter describes a corresponding motion in the barrel and thus cuts the groove.

Eastwood, Edward, of Long Eaton, Derby, engineer. *Improvements in certain parts of railway carriages.* Application dated May 10, 1855. (No. 1055.)

This invention relates to axle-boxes, buffers, draw-springs, and breaks. That portion of it which relates to axle-boxes consists in so constructing them as to permit of the adjustment of the axles when passing over curves.

Beckett, James, of Preston, Lancaster, overlooker. *Improvements in machinery for spinning cotton and other fibrous substances, more particularly applicable to the machines generally known by the name of Smith's self-acting mules.* Application dated May 12, 1855. (No. 1073.)

The improvements consist in so altering the arrangement of the different parts of Smith's mule, that the spindle and carriage-straps are dispensed with, and gearing substituted.

Linsey, John Henry, of Coleman-street, London, account-book maker. *Certain improvements in account-books and other large books.* Application dated May 12, 1875. (No. 1075.)

This invention consists—1. In combining metal springs with a thin metal back. 2. In combining millboard with the metal back, to prevent the edges of the metal from cutting the cover. 3. In the use of longitudinal springs hinged to the covers, to assist in throwing the book open, and keeping the leaves flat, &c.

Pieton, Florent Joseph, manufacturer, Wignehies, French Empire. *Certain improvements in knitting machinery.* Application dated May 12, 1855. (No. 1077.)

This invention consists in the adaptation to large and small circular knitting frames or looms of certain machinery whereby two threads may be fed to the needles at the same time.

PROVISIONAL PROTECTIONS.

Dated July 28, 1855.

1715. Charles Emile Paris, of Paris, France, chemist. A new material to be used in the manufacture of crystal, enamel, and other similar products.

Dated October 12, 1855.

2279. John Clark, of the Strand, Middlesex, lamp manufacturer. Cooking apparatus for the pocket.

Dated October 22, 1855.

2361. Charles Lenny, of Croydon, Surrey. Improvements in carriages.

Dated October 27, 1855.

2397. Edward Stark, of Monkton, isle of Thanet, plumber and glazier. Improvements in pens for writing.

Dated November 1, 1855.

2433. James Leetch, of Margaret-street, Middlesex, gentleman. An improved method of constructing apparatus for the covering of the head.

Dated November 20, 1855.

2610. John Poole, of Riley-street, Chelsea, Middlesex, engineer. An improved mode of regulating the supply of steam from the boiler to the cylinder and thereby better governing the motion or speed of steam-engines.

2612. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved apparatus for dressing flour. A communication.

from Pierre Bruno Joseph Elie Cabanes, of Bordeaux, France.

2614. William Harvey, of Mansfield, Nottingham, mechanic, in employment of John Bradley, of Mansfield, cotton doubler. An apparatus to be employed with reels, cylinders, or rollers, and for placing upon or taking off therefrom hanks, skeins, bands, and other articles without removing such reels, cylinders, or rollers from their bearings.

2616. Charles Frederick Clark, of the firm of T. and C. Clark and Co., ironfounders, of Wolverhampton, Stafford, and Manoah Bower, gentleman, of Birmingham, Warwick. Improvements in bolts and fastenings, which they propose calling Clark and Co.'s Longitudinal Wedge Bolt.

2618. David Simpson Price, of South Moulton-street, Middlesex, consulting chemist, and Edward Chambers Nicholson, of Newington-crescent, Surrey, manufacturing chemist. Improvements in the manufacture of cast-iron.

2620. Oliver Maggs, of Bourton Foundry, Dorset. Improvements in machinery for thrashing and winnowing wheat and other grain.

2622. Coleman Defries, of the firm of Jonas Defries and Sons, Houndsditch. Improvements in the roof-lamps for railway-carriages.

Dated November 21 1855.

2626. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in treating fatty acids. A communication.

2628. Henry William Wimshurst, of St. John's-wood, Middlesex, gentleman. Improved machinery for cutting dovetails and tenons.

Dated November 22, 1855.

2630. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, sworn interpreter, Imperial Court of Paris. Certain improvements in bombs and other explosive projectiles, whose charges are to be fired by percussion. A communication from Horace P. Herdman, of New York, United States.

2632. George Price, of Cleveland Safe-works, Wolverhampton, Stafford, fireproof safe manufacturer. A box, chest, or case, for the preservation of parchment deeds and documents from damage by steam, when placed inside an iron safe made fire-proof on the vapourising principle. Milner's Patent, 1840.

2634. Henry Hibling, of Norwich. Improvements in waterproof boots and shoes.

2638. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in apparatus for making ærated beverages. A communication.

Dated November 23, 1855.

2640. Thomas Tuckey, of Cork, barrister-at-law. Modes of construction, by which steam or other vapour or gas may be used as a source of motive power for some purposes more conveniently than hitherto, and more suitably for locomotion on common roads.

2642. John Pursloe Fisher, of Edgbaston, near Birmingham, Warwick. Certain improvements in the construction of the hammers of pianofortes.

2644. Joseph Ellisdon, of Liverpool, Lancaster, designer and cabinet-maker. Improvements in "castors" for cabinet-furniture.

2654. Samuel Cunliffe Lister, of Bradford, and James Warburton, of Addingham, York. Improvements in spinning.

Dated November 24, 1855.

2648. Samuel Ratcliffe Carrington, of Stockport, Chester, hat manufacturer. Certain improvements in the manufacture of hats.

2650. John Jephson Rowley, of Rowthorn, near Chesterfield. Improvements in machinery for cleaning and cutting turnips and other roots.

2652. Juliana Martin, of Soho-square, London. An improved self-acting incubator.

2654. Hiram Hyde, of Truro, Nova Scotia, gentleman. Improvements in the manufacture of mineral oils. A communication.

Dated November 26, 1855.

2658. Enoch Harrison and Hilton Greaves, of Manchester, Lancaster, manufacturers. Improvements in the manufacture of woven fabrics.

2660. Thomas Greenwood, of Leeds, York, machine-maker. An improvement in the construction of carding-engines.

2662. George Edward Dering, of Lockleys, Hertford. Improvements in galvanic batteries.

2664. James Clark, of Billiter-street, London. Improvements in the chain-wheels used on capstans, windlasses, and other axes.

Dated November 27, 1855.

2666. Thomas Allan, of Adelphi-terrace, Westminster, civil engineer. Improvements in applying electricity.

2668. Hiram Hyde, of Truro, Nova Scotia, gentleman. An improved manufacture of lubricating compound. A communication.

2670. Enoch Tayler, of Baldwin's-gardens, Gray's-inn-lane, London. Improvements in paddle-wheels for propelling vessels in water.

2674. Samuel Amos Kirby, of Hastings-street, Leicester. Improvements in open stoves and grates for rooms and apartments.

2676. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in sheathing ships. A communication from Messrs. Jackson, Brothers, Petin, Gaudet and Co., of Rive de Gier, France, engineers.

2678. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in cleaning and hulling grain and seeds, and in the machinery or apparatus employed therein. A communication from Charles Theodore Laborey, of Paris, mechanician.

2680. Thomas Warren, of Glasgow, Lanark, glass-manufacturer. Improvements in the manufacture and moulding or shaping of glass.

Dated November 28, 1855.

2682. Charles Herbert Holt, of Manchester, Lancaster, engineer. Improvements in steam-boilers, furnaces for the same, and apparatus connected therewith.

2684. George Richardson, of Craig's-court, Charing-cross, Middlesex, merchant and contractor for railway plant and stores. Improvements in buffer, draw, and bearing-springs for railway-carriages and waggons. A communication.

2686. Joseph Lee, of Stonall, near Walsall, Stafford, engineer. Improvements in agricultural or farmer's engines, which improvements are applicable also to locomotive engines.

2688. William Alfred Distin, of Cranbourn-street, Leicester-square, Middlesex. Improvements in cornets and other wind musical instruments.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December 11th, 1855.*)

1695. James Beattie. A combination or contrivance of a folding mattress (with or without a tent attached), hut ambulance for conveyance of wounded or sick persons, pontoon raft and boat, portable cistern and bath.

1715. Charles Emile Paris. A new material to be used in the manufacture of crystal, enamel, and other similar products.

1736. Hall Colby. Improvements in the construction of an instrument for taking altitudes, angles, called an improved altimeter or self-adjusting quadrant.

1748. John Stanley. Improvements in weighing machines and weights used with the same, which improvements apply principally to weighbridges, weighing-cranes, and the class of weighing-machines acting upon lever steelyards, &c.

1750. Samson Woller. Improvements in machinery for weaving figured fabrics.

1753. Daniel Airey and William Henry Lackabane. Improvements in rotatory steam engines.

1758. Jean Baptiste Mourguet. An apparatus for destroying the weevil, its larvæ, and its eggs, whilst drying the corn, without injuring its ordinary properties.

1760. Frederick Robert Augustus Glover. Improvements in the means of carrying knapsacks and other burthens upon or from the shoulders.

1767. Robert Richardson and Walter Greenshields. Improvements in chenille fabrics.

1777. John Avery. Improvements in windlasses for ships and other purposes. A communication.

1778. Henry Gilbee. Certain improvements in constructing flat-bottomed boats. A communication.

1791. William Hopkinson. Improvements in steam engines, boilers, furnaces, and apparatus connected therewith.

1800. Victor Delperdange. A new mode of constructing and joining tubes and pipes.

1855. Peter Armand Lecomte de Fontainemoreau. Certain improvements in Jacquard machines. A communication.

1868. Jean Jacques Danduran. Improvements in diving-apparatus.

1902. William Pitt and Edward Turner Davies. Improvements in the manufacture of cornice poles and picture rods, and in rings and chains to be used in connection therewith.

1911. William Lynall Thomas. Improvements in projectiles.

1948. Edward Newman Fourdrinier. Improvements in machines for cleaning table-knives.

1972. Robert Walter Winfield and John Jackson. Improvements in metallic bedsteads and other acticles of metallic furniture.

1993. George Hearnden Golding. A tool or apparatus to be used in the blocking and lasting of leather, and in other cases where a covering is required to be drawn over a solid substance.

1994. George Hearnden Golding and Thomas Paine. Improvements in the manufacture of boots, shoes, clogs, and other like coverings for the feet.

2010. Agostino Palmiéri and Jean Baptiste Ferrari. A new system of construction of ships or vessels. A communication.

2017. Christopher Penrhyn Aston. Improvements in breech-loading arms.

2169. George Adamson. A travelling staging and crane or jenny adapted for building piers and other harbour works.

2224. Peter Alexander Halkett. Improvements in the application of motive power to and in obtaining locomotion for the cultivation of land.

2236. James Washington. Improvements in apparatus for sweeping chimnies or flues.

2279. John Clark. Cooking apparatus for the pocket.

2357. Henry Woodrow. Improvements in shirts.

2393. John Pinches. Improvements in the construction of dies or stamps for marking papers, linen, or other substances.

2395. Edwin Pugh. Safety alarum and signal-apparatus.

2444. Lewis Normandy. Improvements in securing the rails in railways. A communication.

2459. James Pattison. Improvements in machinery for dressing and finishing woven goods and fabrics.

2493. Samuel Cunliffe Lister. Improvements in weaving pile fabrics.

2501. William Grindley Craig. Improvements in bearing, buffing, and draw-springs applicable to the rolling stock of railways and other vehicles.

2509. William Lund and Alexander Bain. Improvements in pencil-cases.

2510. Thomas Godding. Improvements in the fastening for stays, corsets, and bands.

2542. John Yuil Borland. Improvements in spinning, and machinery for preparing and spinning fibrous materials.

2566. Cyprien Marie Tessié du Motay. Improvements in the treatment of fatty and oily matters.

2568. George Tomlinson Bousfield. An improved safety coal-hole cover. A communication.

2654. Hiram Hyde. Improvements in the manufacture of mineral oils. A communication.

2668. Hiram Hyde. An improved manufacture of lubricating compound. A communication.

2676. John Henry Johnson. Improvements in sheathing ships. A communication.

2680. Thomas Warren. Improvements in the manufacture and moulding or shaping of glass.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

960. Joseph Bentley.
967. Richard Archibald Brooman.
974. Edward Tucker.
998. Donald Beatson and Thomas Hill.
1048. James Bell.
1139. John Livesey.

LIST OF SEALED PATENTS.

Sealed December 5, 1855.

1279. John Gedge.
1289. John Gedge.
1294. James Robertson.
1295. Henry Nunn.

Sealed December 7, 1855.

1313. George Frederick Chantrell.
1325. William Kemble Hall.
1342. Charles Parker.
1345. Frederick Collier Bakewell.
1346. Frederick Collier Bakewell.
1347. John Avery.
1353. Joseph Betteley.
1397. Francis Burke.
1401. John Henry Johnson.
1415. Louis Pol.
1419. William Crane Wilkins.
1426. William Basébé.
1430. Auguste Edouard Loradoux Bellford.
1435. Auguste Edouard Loradoux Bellford.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

The conclusion of Dr. Prater's article, on Fermentation and Putrefaction, will be given in our next.

W. R. Wills and C. J. Recordon. — The publication of your communications on "Steam Used Expansively," and the "Trisection of Angles," respectively, is unavoidably postponed.

A Working Man.—The publication of Mr. A. Watts' articles, on the "Electro-chemical Deposition of Metals," was commenced in the number of the *Chemist* for May last, and has been continued in the successive numbers of that Journal up to the present time.

W. E.—We hope that none of the readers of the penny *London Journal*—which derives very many of its paragraphs from our pages, and publishes them almost always without acknowledgment, and sometimes under very odd disguises—will attribute to us the ridiculous observations you have forwarded, headed, "How to Square the Circle."

Taurus.—The *mean* Launching Draught of the Floating Batteries (having engines and boilers on board, and screws shipped) was 6 feet 10 inches; the *mean* Load Draught, is 8 feet 11 inches. The *Duke of Wellington* draws more water than any other ship of the British Navy afloat; her *mean* Load Draught is 26 feet 4 inches. The *greatest draught* of a ship depends, of course, upon her trim, and may be increased or diminished, within certain limits, by changing the positions of the ballast or other weights on board of her.

Engineer.—We have considered it right to let the publication of your last letter take precedence of that of your former.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, *in the City of London*.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, *Dublin*; W. C. Campbell and Co., Hamburg.

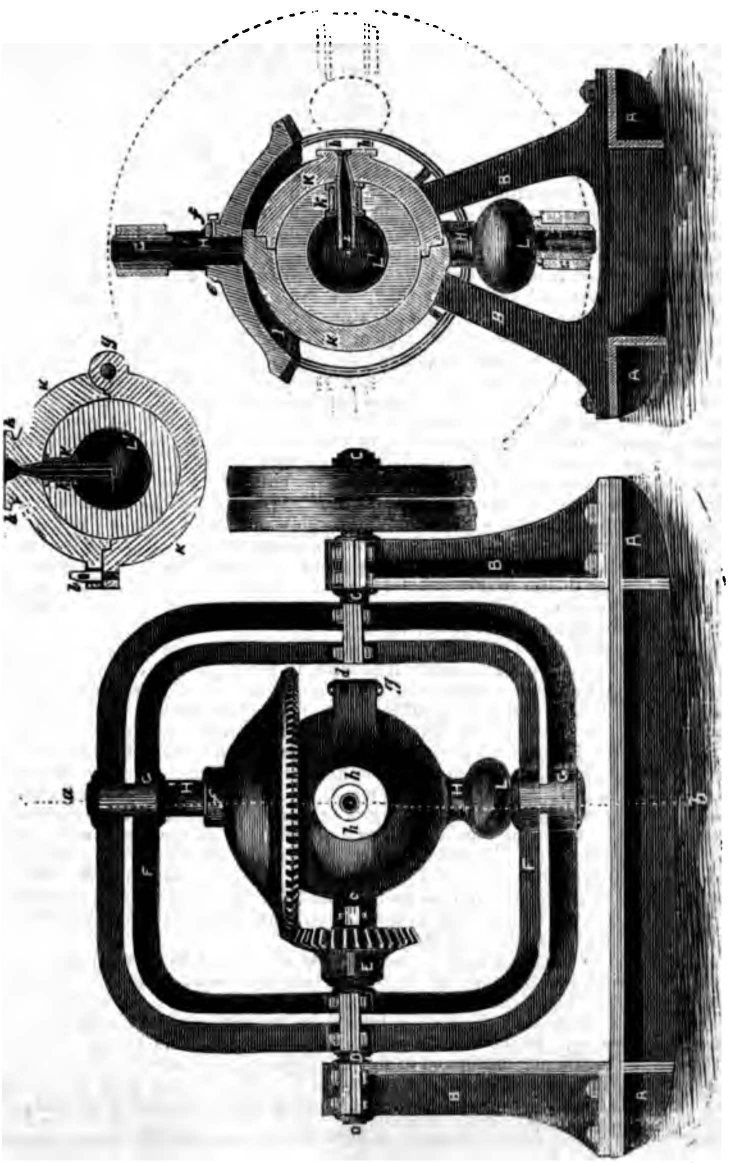
Mechanics' Magazine.

No. 1689.] SATURDAY, DECEMBER 22, 1855. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

PETERS' MACHINERY FOR MANUFACTURING HOLLOW PROJECTILES.

Fig. 2. Fig. 3. Fig. 1.



PETERS' MACHINERY FOR MANUFACTURING HOLLOW PROJECTILES.

(Patent dated June 7, 1855.)

Mr. R. Peters, engineer, of Southwark, has patented a machine for manufacturing ordnance shells and other hollow vessels, from which very excellent results are obtained. His invention consists in the employment of a hollow mould made in two or more parts, into which metal or other material is poured through a pipe which descends about midway into the mould, and in imparting to the mould, after a sufficient amount of material in a fluid or semi-fluid state has been poured therein, two rotary motions at right angles, or nearly so, to each other. The centrifugal force acting in all directions distributes the contents of of the mould evenly all round the inside thereof, while the internal pipe acts as a vent for the escape of air and gases, and prevents any considerable quantity of material, if any, being forced therefrom. On stopping the two motions, and opening the mould, the hollow article will drop out perfectly formed. When making shells, and if so desired, the inventor inserts round the outside of the internal pipe a ferule screw threaded on the inside. This ferule will become incorporated with the shell, and will be ready for receiving a fuse threaded with a corresponding screw. It may be also necessary to insert a plain ferule round the pipe when forming other articles, to prevent adhesion thereto.

Fig. 1 of the engravings on the preceding page is a front elevation of the machine; fig. 2 a section through the line *a b* of fig. 1. A A is a sole plate, to which the standards, B B′, are firmly bolted. C is a shaft, free to revolve in bearings on the standard, B′. One end of this shaft is fixed to one side of a frame to be hereafter described, while the other end carries fast and loose pulleys. D is a shaft, one end of which is fixed in bearings in the standard, B, and, after passing through one side of the frame before mentioned, has keyed to the other end of it a fixed toothed pinion, E. F is a frame for holding the mould, R, shown separately in fig. 3, a section through the line *c d* of fig. 1. G G are bearings made in two opposite sides of the frame for receiving the spindles, H H′, which are cast with or otherwise connected to the mould. I is a toothed wheel cast with a boss, *e*, free to be moved upon the spindle, H′; *f* is a screw for fixing it in a position for gearing into the toothed pinion, E, and at the same time to cause the spindles, H H′, and mould, K, to revolve with it. L is a weight or counterpoise on the spindle, H, to the toothed wheel, I. and boss, *e*. K is the mould, formed in two parts, united by a hinge, *g*, and carried and supported in the frame, F, upon the spindles, H H′. One part of the mould is flattened at top, as at *h h*, and is provided with a tube, *i*, through which metal is poured into the mould, and which also serves as an air vent. *k* is a ferule placed on the tube, *i*, before closing the mould and proceeding to cast a shell. This ferule is tapped with a screw thread on the inside for receiving the screw of a fuse. *l* is a pin and cotter for keeping the two parts of the mould together after the part with the tube, *i*, has been hinged over on the other part.

The operation of the machine is as follows:

The frame must be turned over to bring the mouth, *h h*, of the mould uppermost, and must be so held while metal, in a sufficiently fluid state, is being poured therein; rotary motion is then communicated from a steam engine, or other prime mover, by a strap to the fast pulley in the shaft, C, and this being affixed to one side of the frame, F, causes it to revolve, the opposite side revolving loosely round the shaft, D. The frame carries with it the mould and toothed wheel, I, which wheel being fixed to the mould spindle, H′, and gearing into the fixed toothed pinion, E, is caused to partake of rotary motion round its own axis, and consequently to impart its motion to the mould, K, which is thus made to revolve at the same time round two diameters at right angles to each other. The motions communicated being rapid, the metal in the mould is thrown centrifugally all round and evenly over the inner surface of the mould, and adheres to the ferule round the tube. The motions of the mould are continued until the metal becomes set. L′ is the formed shell. To release the shell the frame is brought into the position shown at fig. 1, the screw, *f*, is removed, the wheel, I, raised, the pin knocked out from the cotter, and the mould opened upon the hinge, and the shell drops out ready to be charged.

The thickness of the shell may be increased or diminished by pouring into the mould more or less metal, and the time the metal will take to set will, of course, vary with the quantity supplied. The mould may, if found desirable, be lined with any suitable material, and may also be cooled after the shell is formed by the application externally of water or other cooling matter. In the forming of other hollow articles than shells without a core, the form of the mould may be altered to suit the shape to be imparted to them; and where casting other than metal, the mould may require to be kept heated while the material is being poured in, in order to keep it sufficiently fluid until the machine is set going.

ARE LIEBIG'S LAST VIEWS ON FERMENTATION AND PUTREFACTION TRUE?

BEING A SECOND MEMOIR ON THIS SUBJECT.

BY HORATIO PRATER, ESQ., M.D., &c., &c.

(Concluded from page 532.)

As an appendix to the present essay, I have thought it as well to add part of a lecture, delivered by Professor Owen, on the subject of "Animalcular Life."

"There is a distinct respiratory action performed by the ciliated integument; but, strange to say, it is conducted in a directly opposite manner to that which obtains in other animals in respect to its result, and is analogous to the results obtained from plants. In the summer time you will see a pond covered over with a green film, and you will also discover bubbles over its surface filled with gas which is pure oxygen, given off by the animals composing that film; so that they perform the same function as plants in eliminating pure oxygen."

"In reference to that alternative which, if we reject Ehrenberg's view of the relation of the germ-cells to the diffusion of the species, we are compelled to adopt, namely, the theory of spontaneous generation, I may here point out one of the best experiments which have been made, to show that when due caution is observed, the appearance of infusoria in artificial infusions does not take place. Professor Schulze filled a glass half full of distilled water, in which were mixed animal and vegetable substances; he then closed it with a good cork, through which were passed two glass tubes, the whole being air-tight; the infusion was then subjected to boiling heat. While the steam was escaping from the bent tubes, the Professor fastened at one end a vessel filled with sulphuric acid, and at the other a vessel filled with a solution of potass. (The form of the apparatus was illustrated by a diagram.) By the act of boiling, it was presumed that every animalcule and germ of living thing in the flask were destroyed; whilst all access was cut off by the sulphuric acid on the one side, and by the potash on the other. The apparatus was then exposed to the influence of *summer* light and *heat;* at the same time there was placed near it an open vessel, with the same substances that had been introduced into the flask, and also after having subjected them to a boiling temperature. In order to renew constantly the air within the flask, the experimentor sucked with his mouth, several times a day, the open end of the apparatus filled with the solution of potash, by which process the air entered his mouth from the flask through the caustic liquid, and the *atmospheric air from without entered the flask through the sulphuric acid.* The air was, of course, not at all altered in its composition by passing through the sulphuric acid in the flask; but all the portions of living matter, or of matter capable of becoming animated, were taken up by the sulphuric acid and destroyed. From the 28th of May until the beginning of August, Professor Schulze continued uninterruptedly the renewal of the air in the flask, without being able, by the aid of the microscope, to discover any living animal or vegetable substance; although, during the whole of the time, observations were made almost daily on the edge of the liquid; and when, at last, the Professor separated the different parts of the apparatus, he could not find in the whole liquid the slightest trace of infusoria or confervæ, or of mould; but all three presented themselves in great abundance a few days after he had left the flask standing open. The vessel which he placed near the apparatus contained on the following day vibriones and monads, to which were soon added larger polygastric infusoria, and afterwards rotifera."

"Now as to the vital part these infusoria play in organized nature. If, when a plant or animal is dead and becoming decomposed, the particles were to go on in decomposition to their ultimate elements, there would be so much organic matter lost: but animals cannot subsist without organic matter; and thus, if the destroying power were to go on, there would soon be a gradual decrease in organic life. This decomposition mostly takes place in water, and here it is that we find the largest number of these animalcules, ready to convert the decomposed matter into their own tissues. For when the dead organic matter is dissolved or suspended in water, in that state of comminution and decay which immediately precedes its final decomposition into the elementary gases, and its consequent return from the organic to the inorganic world, these wakeful members of Nature's invisible police are everywhere ready to arrest the fugitive organic particles, and bring them back into the ascending stream of animal life. Having converted the dead particles into their own living tissues, the *Polygastria* become the food of the *Rotifera*, these of the small *Vermes* and *Crustacea*, which, in their turn, fall a prey to fishes, and thus a pabulum fit for man himself is brought back by a short route from the extreme bounds of the organized realm. There is no primordial self-subsistent organic matter, as Buffon taught. The inorganic elements are organically combined, and fitted for the sustenance

of animals by the operation of the vegetable kingdom, which thus stands, as it were, in the breach between animal matter and its ultimate destruction. But in this important office plants are assisted by the Polygastric Infusoria. And these minute animalcules, like true beneficence, work their good unobtrusively and unseen."

Observations.—It will be seen, by reference to the second extract, that Schulze's experiments were made by forcing the external air to pass through sulphuric acid. The question, then, in this case will be whether such air would not retain a *very* minute proportion of this acid in some modified state (sulphurous acid gas or other.) If so, as such gas in the very smallest proportion (according to Thenard's experiments) is one of the most fatal, it is clear that the doctrine of equivocal generation would still require further research before it could be considered as completely* overturned; more particularly as the apparatus was exposed to the "summer heat" of June and July. As such air was only in *very limited* contact with solution of potass, probably its carbonic acid was not removed by this agent. Besides, with all his powers of microscopical observation, Ehrenberg has not yet been able to see the animalcules propagate *by ova*, but only by *division*. He *conjectures* they propagate *also* by ova, to oppose "spontaneous generation." The parts enclosed in the first and third brackets relating to the same point, viz., the *uses* of the infusoria in Nature, will be here noticed together.

It appears by the first extract that the respiratory process of the infusoria resembles that of plants rather than of animals, and that they tend to *purify the air* by giving out pure oxygen, at least in the day time. Besides assisting the vegetable kingdom by acting in this way, they also may be said to assist that part of the animal world (viz., hyænas, vultures, &c.), the particular use of which in the order of Nature seems to be to prevent the loss of organic matter by decomposition; which effect they ensure by their *scavenger-action* of preying on the bodies of those who have died from disease or accident. In like manner infusoria, as Professor Owen says, prevent decomposing animal and vegetable matters from being resolved into *ultimate* elements, and thus lost for purposes of food to living beings.

These *uses* of infusoria, so clearly made out, quite alter the character of equivocal generation, considered as a question affecting theology; for, *admitting such uses* a person may believe in equivocal generation, and yet not have the most remote idea that any other than these microscopic beings have been or can be produced in a similar way. In the pride of increased knowledge of modern times, he might smile (if levity were proper on such a subject) at the at once absurd and ingenious opinion of Lucretius, that the world having *now grown old*, cannot, as formerly, produce the larger sort of living beings, but only the *most minute!* The modern philosopher may now, in the language of the poet, view infusoria as designed, at *the very commencement of creation*, to seize, as it were, the liberated feeble vital flame which has just left the organized matter of the larger animal or vegetable, and preserve it till the appointed time comes for them themselves to transmit it to some feeble insect, but a scale higher than themselves in the vast link of creation!—soon again destined from this to take its course through the whole range of existence, till it again reaches to its starting point.

It is satisfactory on a subject like the present to be able to vindicate the most perfect freedom of thought as even the most *useful* course which can be adopted towards society. The suspicion that must ever attach to any attempts to coerce the mind must always be detrimental to the real interests of religion. Let mind grapple with mind, and often, as here, the most, at first sight, seeming atheistical view, will, in the course of inquiry, assume quite a different aspect, and come *actually to our aid* as one of the strongest arguments in favour of design!

Note.—The subject of *Entozoa* still wants clearing up, before we seem qualified to pronounce a decided opinion, *pro* or *con*, in reference to equivocal generation. I observe the latest researches of M. Blanchard* support the fact that neither ova nor very young flukes are found in the livers of oxen or sheep, but only flukes in the adult state. If this be true, it is certainly much in favour of their being actually formed there; but we must wait for further observations to see if the so-called fact be true.

* Mr. Faraday some time ago proved that even a great many *solid* substances evaporate (so to speak) at the ordinary temperature of the air. I have suspended a piece of litmus paper in the air of a bottle filled to only about one-twentieth part with sulphuric acid, being sure the paper could not be touched by the acid itself. I considered, on comparing it with another piece of litmus paper, that it was not reddened, though left above an hour over the acid, at a temperature of 60° or 70° Yet some acid must surely evaporate per Faraday's experiments. It would be well that this experiment were repeated with flies suspended over the acid in gauze before we can pronounce decisively.

* Abridged in the *Moniteur*, August, 1852.

THE INVENTION OF GROOVED ROLLERS FOR THE MANUFACTURE OF BAR IRON.

BY DAVID MUSHET, ESQ.

(*Concluded from page* 559.)

Mr. Davies Giddy, whose duty it was, as Chairman, to move for the vote his Committee recommended, failed to do so, and the widow and the orphans of the pillaged had to endure the further injury of paying this sum, about £250, out of the farthings of their rifled treasury.

To give the overwhelming mass of evidence received from competent quarters, by Mr. Coningsby Cort, in contradiction of this nefarious report, would occupy too much space; as the Committee *refused* to complete the investigation, it came too late; but as a specimen of the *animus* of the witness who directed their decision, I will give one letter. Homfray, it appears, being hard pressed by the facts, that such and such things had been done by Mr. Cort at Cyfarthfa with the puddling furnaces, of which he denied the utility, improvised a defence worthy his position, viz., that Mr. Cort had gained his results by unfair means, in mixing scrap iron already malleable in the puddling furnace, and that the workmen detected the fraud:

"*Wortley Iron-works, near Sheffield,*
"*Feb.* 20, 1812.

"DEAR SIR,—Yesterday's post brought me your letter, containing a copy of Mr. Samuel Homfray's evidence before the Committee on your petition, which very much surprises me, to remark such pointed severity against your father, with whom, while your father was with me at Cyfarthfa, I conceived he was on terms of good will at least. I inclose you the best account in my power of transactions now almost worn from my memory.

"I never knew that any of Mr. Cort's workmen did throw any scrap iron into the puddling furnace at any time, nor at Cyfarthfa could they do so, as we were not at that place in the habit of using any scrap iron.

"And the circumstance related by Mr. S. Homfray, of Mr. Cort being *hissed* or *hooted* out of the works at Cyfarthfa, where he lived in my family, could not happen without my knowledge; and I declare I never saw Mr. Cort or heard of his being treated with any kind of disrespect by any of the workmen, at any time.

"JAMES COCKSHUTT.

"Mr. Coningsby Cort."

This is enough: if in this narrative, in any part, I violate the heathen maxim, *de mortuis nil nisi bonum*, Mr. Homfray is my apology.

It must be clear to every reader, that the various interested parties on the Committee had but too much reason to make haste to set an extinguisher on the very disagreeable claims of Mr. Cort. *Justice* would have led to a revision of the conduct of the Paymaster of the Navy and his solicitor; Mr. Cort's estate had legal claims against Mr. Crawshay and S. Homfray, exceeding, perhaps, £100,000. How could these men recommend a *Parliamentary reward?* The Navy officials on the Committee must have hailed Mr. S. Homfray's *début* on the Parliamentary stage as a *deus ex machinâ* in their distress. To deny and stultify the resolution he had signed at Gloucester the year before was a strong step; but the necessities were strong and his vociferous fictions (for he was a very noisy character) were a grateful clamour, in which truth was drowned, and a body of the people's representatives enabled to perpetrate and cloak over the greatest crimes on record in the treatment of intelligent merit.

Had not Mr. Davies Giddy been overborne and bewildered by the torrents of invention issuing from his interested friend, he would doubtless, as a man of scientific eminence, have seen the importance of the scientific facts under investigation. There were two distinct processes before him—one chemical, the other mechanical; the action of the flame of pit coal in changing cast iron into malleable iron, and the action of rollers in producing certain mechanical and dynamical results of the highest interest, both eminently deserving the attention of the chemist and the mathematician, independent of the fact of the vast importance of their result as physical arrangements of *practical science*. Mr. Giddy might not have been practically scientific; he might have been only "theoretic;" but even in that case there was abundant scope for the exercise of that theoretic science which assumes the transcendent sovereignty over all physical problems, and in which he was eminent; and it certainly is unfortunate that a mathematician was not so sufficiently alive to these important inventions as to persevere insistingly on discovering their inventor; for *somebody* must have invented them. Subsequently he was, as Mr. Davies Gilbert, raised to the chair of the Royal Society. But here he was scared from his propriety, and that is all that can be said about it. An acute and sensitive mind is at a loss in dealing with ruffians. I recollect it used to be one of his favourite remarks, that could a man be made in a moment transparent, so as to see at a glance the whole functions of life revealed, and the delicate and hair's-breadth processes upon which the tenure of his ex-

istence hung, he would die with alarm at the precarious spectacle; and probably he felt an equal terror at continuing a scrutiny which would lay bare the horrors of the anatomy of baseness in the hearts of friends.

Forty-three years have rolled on since the date of this performance; most of the actors are in the grave; and I could tell authentic tales of the agonizing remorse of death-beds haunted by the silent image of a murdered friend, which no cries could drive away. But what avails it? I cannot hope, by any words of mine, to shake in any heart that strongest of our common enemies, the *auri sacra fames*. The inventions live, and a million mouths are daily fed by them. We may calculate that thirty workers are employed from the raising of the minerals to the delivery to the consumer upon each of the 10,000 tons of iron manufactured daily in Great Britain. Assume two souls and a fraction as the average depending on the 300,000 workers, we have a million fed with their daily bread by the processes of production and sale. The mouths fed after the iron is transferred to smiths, engineers, ship-builders, RAILWAYS, merchants home and foreign, with all the intricacies of life into which iron enters, are not so easy to estimate; but it is, perhaps, not too much to assert that two millions more of our labouring population are directly maintained by Cort's inventions of puddled iron and grooved rollers. There are also living, besides his inventions, two unmarried daughters of Mr. Cort, aged more than seventy years. On the determination by death of their mother's pension of £125, in 1816, a munificent extension of the bountiful gratitude of the Treasury was made to them, in pensions of £19 a year each, which sums form, *as they are an acknowledgment of their father's claims*, either the most distinguishingly honourable item on the oft-abased pension list, or the reverse. Had Cort's patents been extended like those of Watt and Fourdrinier, they would have inherited at least half a million of money, and perhaps such honours as were similarly earned by Foley,* the enterprising fiddler of Worcester. A third daughter, similarly aged, is a widow, wholly unprovided for. In the last month, Lord Palmerston benevolently granted £100 out of a public fund, to two maiden ladies, one yet older than Mr. Cort's children; and, in very truth, the necessitous aged, who are very numerous, demand our tender care. But the special public claims of these ladies are, that one is the god-daughter of the venerable Samuel Johnson, and that they possess between them that rare archæological relic, the deal table on which that great man, truly and absolutely the last giant of our literature, wrote the invaluable "English Dictionary." These discoveries have excited a lively, and no doubt, as far as their means will allow, a pecuniary interest amongst the humbler literary characters of our degenerate days, some of whom I have known, and can witness to be liberal and amiably conscientious men; and it is gratifying to see them banding together to protect and not to crush the chips of their own block. But are we to say to our rulers, "Ye pay tithe of mint, and anise, and cummin, and have omitted the weightier matters of judgment, mercy, and truth; these ought ye to have done, and not leave the other undone." The weightier matters of the claim of the family of Cort are, as I have related them, the greatest public services ever rendered by any one man to his country, requited by the basest injuries that any one man ever received. The sum total of his services, to date in sixty-six years, are thirty million tons of iron, made by his processes, three hundred millions sterling to foreign importers saved, and three hundred millions of value created within our own shores; six hundred millions of wealth conferred on his fellow-countrymen, and 600,000 of the working population, on an average, of three or four working generations directly maintained. What would have been the termination of our last great war against the whole continent, but for the riches and *machines* made out of Cort's *bar iron?* What would have been, without him, the present war with Russia? a *desperate, defensive struggle*. We never could have dared to arraign that empire, and proudly chide her oppressions, had she been that which in 1784 she was rapidly advancing to be, the iron-making country of the world, *and we without iron*. What would Richard Crawshay's ten tons a week, or even a possible increase

* The singular adventures by which Foley, in the early part of the last century, smuggled from Sweden their then newly invented "slitting mill," (see Scrivener's "History of the Iron Trade"), and founded the fortunes and title of the present Earldom, are well known. About the same date the tin plate manufacture and the rolling or plating-mill, as it was termed, for producing the sheet iron by means of *plane* rollers, was imported from Germany. Some persons unacquainted with these practical details have been at a loss to reconcile with Mr. Cort's originality a clause in an Act of Parliament passed 1750, prohibiting the erection of slitting-mills and *rolling or plating mills* in the American colonies. Mr. Cort's invention was the *grooved* roller, by which the small sizes of iron previously slit from larger *hammered* bars and flats were spun out by one operation in an instant of time, and by which *grooved rollers railway bars* are now made. For ample and conclusive evidence of the novelty of this invention, incontrovertibly recorded by the fifteen leading firms of the Iron Trade assembled at Gloucester in 1811, see Mr. Richard Cort's "Facts and Proofs."

to twenty or thirty tons, have availed against her inexhaustible resources for the finest charcoal manufacture, under a Government which *encourages* and *rewards* merit? We need not to have then sailed 3,000 miles to see Sebastopol. Such strong fortresses might have been much nearer home. How many thousand miles of railway could have been constructed in a century with *hammered rails*, or should we have dashed our hundreds of tons of locomotive trains along the tenacious surface of cast iron girders? But it is needless to particularise what is universally known. The difficulty has not been to *know* the value of Cort's services; that was known very early; the difficulty has been to *acknowledge* them. There is also still surviving one son of the pillaged benefactor: unemployed during the past year, and unprovided for, at seventy-one years of age, he has had leisure and a very sufficient motive, less felt during the vigour of an upright and laborious life, to collect the whole evidence of his father's injuries, and is preparing to bring the matter before the representatives of the people next Session, that the disgrace of the present position of the family may be wiped out, some decent provision made for them in their declining years, and the true claims of the inventor of the puddling furnace and grooved roller placed properly on record. It would be an enduring shame to the Government of any country to suffer ignorance or ambiguity on facts of so vast importance. If Cort did not invent them, some one else did. Who, then, is he? Whether Brute (ominous name) was the first King of Britain, or whether Æneas founded Rome, may be a difficult research. The date and founder of the British iron trade is more easily traced, and it will be a crime exceeding anything in the annals of ingratitude to publicly leave the children of such a man one hour longer in INDIGENCE.

But the cost of bringing the case completely before the House of Commons will be considerable, much more than in 1812; and if it were no more than the sum of £250, in which these orphans were then so cruelly fined by the Legislature for asking justice, they have not now the means to risk. In a letter in the *Journal of the Society of Arts*, of October 26, which may be worth the perusal of every man who thinks that any man ever deserved a national testimonial, it has been proposed, by way of setting an example to the iron trade and the Legislature to do their duty better than they have hitherto performed it in this matter, that a preliminary fund should be raised by the penny subscriptions of the two or three millions of iron-making and other working men, to whom Cort has given their daily bread. They have never before been appealed to, and their honest blood must tingle when they read here what the appeal to others has produced.

It is, indeed, the cause of every intelligent operative in the country, to aid in seeing the oppression of inventive merit vindicated before the nation, and *prevent themselves* becoming similar victims to those who may hereafter have the power and the will to rob *them* of the fruits of the thoughts of anxious nights and laborious days. There are nearly two hundred Mechanics' and other institutions in union with the Society of Arts, which have been appealed to, to promote and receive these subscriptions, and a Metropolitan Committee, including the Chairman of the Council of that Society, and the President and Secretary of the Institute of Civil Engineers, is being formed to conduct the Appeal to Parliament. Should Parliament, which I cannot believe, continue deaf to such claims, the surplus of the subscriptions of the poor may be enough, after paying the costs of the contest, to shame the ingratitude of the rich, by purchasing an annuity sufficient to preserve four persons, far advanced along the vale of years, from suffering the anxiety of want, when surrounded by tens of thousands on whom their parent has conferred enormous wealth. We hear much of the National honour; and, as it must dwell somewhere, we may, perhaps, now test in which class of our society it resides.

I trust to be able shortly to send you some particulars, *with drawings*, of the original specifications of Mr. Cort's patents, supposed to have been destroyed in the fire at Westminster Hall. They have but lately been discovered; they will supply evidence what it was that Cort *did* invent, and patent, in 1783 and 1784.

November 28, 1855.

ADAMS' SUSPENDED GIRDER RAIL.

SOME interesting experiments were made on Monday last on a new system of permanent way, invented by Mr. W. Bridges Adams. It was laid down under the direction of Mr. Joseph Cubitt, C.E., on part of the up-line of the Great Northern Railway, over which the heavy coal traffic passes to the goods station, Maiden-lane. It consists of a rail similar to the ordinary rail, but two inches deeper—that is, 7 inches instead of 5 inches in depth, and has a flange at top and bottom. On each side are fitted angle

brackets, one side of the bracket filling up the space between the flanges, and being secured to the rail by bolts. The other side of the bracket extends outwards, forming a kind of longitudinal shelf at each side of the rail, level with the ballast, and immediately under the upper flange of the rail, so that when ballasted, all that is seen of the rail is the upper flange, which rises about 2½ inches above the upper side of the longitudinal shelf. These brackets project about 6½ inches on each side of the rail, and form with the rail a longitudinal and horizontal bearing of 13 inches in width. The ballast is packed from the surface at each side of the rail, under the brackets, and thus secures the permanent way. There are no wooden sleepers used, the gauge of the rails being preserved by iron ties about nine feet apart. The whole is constructed of wrought-iron, and consists of four parts, namely, the rails, brackets, the bolts, and tie-bars. Each joint is protected by two whole pieces at each side of it, forming in the whole when put together a compact mass. The rails were made at the Ebbw Vale works, and are 18 feet in length, and the angle brackets are 9 feet in length. The various parts are so contrived that no mistake can occur in putting them together, and they can also be laid down with great facility.

By this plan of rail, the bearing surface is brought about within 2½ inches of the tread of the wheels, and the consequence is that the rail is prevented from rocking, the lower part of the rail forming a kind of keel, and the brackets constitute bearers on each side, which impart a steadiness to the rail, and a smoothness in passing over it. The packing being close to the surface, the greatest regularity can be preserved in packing the ballast under the bearers, so as to give a uniformity to the bearing of the rails, not obtainable by any other method in use. On the ordinary system, the packing under the sleeper is 12 inches below the top of the rail, while on Mr. Adams's plan it is not more than about 3 inches. The rails and bearers form one continuous piece from end to end of the line. The portion of the line upon which the new way is laid has a gradient of 1 in 110, and coal-trains of 300 tons and the heaviest engines pass over it about sixty times a-day. It has been laid down about a month, and appeared in excellent condition. On the suggestion of Colonel Kennedy, of the Bombay and Baroda railway, the ballast for about 6 feet in length, at two or three places, was removed from under the rail and bearers, and an engine of 35 tons weight passed over it several times, causing each time a slight deflection of about one-eighth of an inch, and was considered by the other engineering gentlemen present, namely, Messrs. J. Cubitt, B. Burleigh, Forde, C. H. Gregory, Pole, D. K. Clarke, and J. Robinson, a very satisfactory test of the strength of the "girder rail." It was also observed that anything out of order in that kind of permanent way could be readily detected, as it would be visible. The weight of the rail is about 84lbs. per yard and of the brackets 84lbs., making together 168lbs. per yard. It was stated that the cost of the permanent way on that plan would be about £300 per mile more than the ordinary line of heavy rails, and that the cost of renewal would average less than one-half. Some of the men said that they could pack up 100 yards of line on the new plan in less time than they could open 20 yards of the ground prior to packing the sleepers of the ordinary rails, and therefore it was presumed that a considerable saving in the labour of maintenance of way would be effected by the adoption of the new plan. It is understood that it will be adopted on the Bombay, Baroda, and Central India railway, being considered suitable in many respects for that country.

Mr. Adams's method of fastening the ordinary rails to the sleepers, described at page 28 of our last volume (No. 1640), was also tested. It consists, as our readers will remember, of bracket or knee fastenings bolted to the rails and sleepers, which permit of the rails bearing directly on the sleepers, instead of being elevated above them by the chairs ordinarily used, and thus preventing the under side of the rails being hammered against the chair which produced noise to the passengers and injury to the rails and rolling stock. The result of the trials were very satisfactory.

BONELLI'S SYSTEM OF RAILWAY SIGNALS.

A second experiment to test Chevalier Bonelli's apparatus for establishing a telegraphic communication between trains in motion, took place on the 7th, on the Paris and St. Cloud section of the Western railway. M. Bonelli's system consists of a thin iron bar running parallel to the rails, and fixed edgeways upon insulators of earthenware, which raise it about three inches above the surface. A combination of springs establishes a communication between this bar (which the inventor calls a *line-bar*) and a telegraphic apparatus fitted to one of the waggons.* In the present instance, a train containing M. Bonelli, M. Rougher, minis-

* For a full illustrated description of Chevalier Bonelli's apparatus, see *Mechanics' Magazine*, current volume, p. 315 (No. 1678).

ter of public works; Count Cavour, president of the Sardinian cabinet; M. Vuillefroi, president of the committee of inquiry on railway accidents; Viscount de Vougy, director-general of telegraphic lines; and other distinguished personages, started at noon from the terminus of the Rue St. Lazare, and was soon followed by a second train, containing the other members of the committee of inquiry. This second train stopped near Clichy la Garenne, where M. Bonelli's line bar begins. The first train continued its way, the second representing a fixed station. Telegraphic communications were then exchanged with perfect success, and after a while the first sent an order to the second to follow, and both trains being then in motion, communications were exchanged as before, orders sent, &c. At St. Cloud both trains stopped, notes were compared, and the dispatches were found to tally exactly. The experiment was considered to have been successful.—*Galignani.*

The Elements of Practical Hydraulics, for the Use of Students in Engineering. By SAMUEL DOWNING, M.A., Professor of Civil Engineering, in the University of Dublin. London: Longman, Brown, Green, and Longmans. 1855.

This work, as the author informs us, is intended as a text book for the students in the School of Engineering, Trinity College, Dublin, in that branch of their intended profession which has reference to practical hydraulics. It is divided into three chapters; the first of which treats of the flow of water through an orifice or over weir-heads with a uniform head; the second treats of the same with a variable head; while the third has reference to the flow of water through pipes.

The two former chapters are professedly little more than a translation of D'Aubuisson's "*Traité d'Hydraulique à l'Usage des Ingenieurs,*" which has been adopted as an authority very extensively. The third chapter is founded on the formula in general use amongst English engineers.

To those at all acquainted with the Science of Hydraulics, it is well known that the *theory* of the subject is contained in a very few propositions. For example, the whole of the theory, as far as the first chapter is concerned, is confined to three points;

1. To the determination of the velocity with which a fluid issues through an orifice in a vessel.

2. To the form of the issuing stream.

3. To the discharge through an orifice of any finite dimensions, or over a waste board.

For the first of these points, theory furnishes the expression.

$$V=\sqrt{2gH} \text{ or } \sqrt{2gH+u^2}$$

Where H is the *charge*, that is, the depth of the centre of the orifice (supposed small) below the free surface, g, the accelerating force of gravity, and u the velocity of the stream, if it has a sensible velocity independently of the discharge.

For the second, the form of the issuing stream is very approximately a parabola, if the velocity be small, and consequently the resistance of the air small also.

And for the third, the discharge through a finite orifice, the charges upon the lower and upper sides of which are H and h respectively, and whose breadth is l

$$=\tfrac{2}{3}l\times\sqrt{2g}\,(H\sqrt{H}.-h\sqrt{h}).$$

These theoretical expressions are all too great, because the assumption on which they are founded, that the threads of the issuing stream are *parallel*, is known to be incorrect. In fact, where a fluid issues through a small orifice in a thin plate, the effective orifice is from this cause much smaller, and is called the *vena contracta*, or contracted vein of the fluid.

The most important question for practical hydraulicians to solve is, what *fractional* part of the theoretic discharge is to be taken in every possible case that may arise? Many series of experiments have been instituted with the view of solving this question; and these are detailed by Mr. Downing with great accuracy, and the cases in which the several coefficients are applicable, including those in which adjutages, as they are termed, or tubes fitted to the orifice, are applied, are carefully distinguished.

In the second chapter the theoretical discharges, under a variable head of water, are investigated, and the proper coefficient determined.

To these two chapters is appended a series of examples, many of them derived from cases which exist in practical operation, including the irrigating canals of Lombardy and Piedmont, which are of a highly interesting and instructive character.

In the third chapter, the laws of friction of a fluid flowing through a tube or channel, are carefully and accurately laid down, together with the practical results, as regards the discharge of water through such channels, and the necessary dimensions and form to be given to a canal or pipe, to secure a given discharge of water.

The theory of this portion of the subject, as given by Mr. Downing, seems to us sound. The expression at which we

arrive by its help,* is that which has been generally adopted by the engineers of this country, and possesses the inestimable advantage of simplicity. Thus, if v be the uniform velocity with which water flows through a pipe or channel, whose length is l, and has a fall h; and S be the area of the section, C the border or wetting perimeter, the result arrived at is

$$v = 100 \sqrt{\frac{h}{l} \frac{S}{C}}$$

and if Q be the quantity of water discharged in a second

$$Q = 100 S \sqrt{\frac{h}{l} \frac{S}{C}}$$

Experiment shows that the true form of the expression for the resistance is

$$a(v^2 + b v)$$

and the results obtained by omitting the second term are a little too high.

The expressions given by Mr. Downing, are obtained by omitting this second term; but the very small amount of error arising from this omission is more than compensated by the simplicity of the expressions, and the consequent facility with which they can be applied.

Many interesting questions arise from this view of the subject, amongst the most important of which is, the best form to be given to a canal of given length and fall, in order that a given amount of water may be discharged from it. This, and other questions of a similar kind, are very ably discussed in the third chapter of Mr. Downing's work.

We have great pleasure in recommending this treatise as being replete with useful, interesting, and *sound* information. We think it will be found a great acquisition to the engineer, and more especially to the engineering student.

We observe, with much satisfaction, that the Governing Body of the University of Dublin, have not only founded a school of engineering, in connection with that seat of learning, over which Mr. Downing is appointed to preside, and who appears to be, as far we can form an opinion, judging from the work before us, "the right man in the right place;" but have also defrayed the greater part of the expenses of the printing of that gentleman's treatise. We hail with pleasure this most tangible proof, that one at least, of our ancient Universities is alive to the requirements of the age, and the duties it owes to the rising generation, and we heartily commend this example to our other great seats of education, which will do well to follow in the path thus pointed out.

ON THE EXPANSIVE USE OF STEAM.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. David Mushet, in a letter published in your number for 17th November last, speaks of the very limited amount of discussion which has been called forth upon the subject of expansive steam. My knowledge on the subject is chiefly theoretical; but perhaps my remarks may not on that account be the less practical. No mistake can be graver than to suppose, as is too often done, that correct theory has but little bearing upon efficient practice. It is true that the results of theory can scarcely ever be completely realized in practice, but, on the other hand, this falling short in the attainment of calculated results is due entirely to the fact that there are always various impediments which have not been (and are not pretended to be) taken into account in the theoretical consideration of the subject. But it is not less true that an approximation more or less close can always be made to the theoretical result.

The assumption often made, that as the theoretical conditions are assumed ones never really realized, the teachings of mathematical science are not to be relied upon as a guide in practice, is founded upon ignorance as to the respective provinces of theory and practice. Let the practical man take the trouble to ascertain what the assumptions are upon which the theoretical truth holds good, and apply himself to realize them as nearly as possible, and results will be obtained approaching more and more nearly to the theoretical result the more nearly the conditions assumed by the latter are complied with. Amongst persons duly acquainted with the subject, no two opinions can exist as to the enormous advantage of using steam expansively. Neither Mr. Mushet's anticipations nor Mr. Craddock's are in the smallest degree beyond the truth. The person who doubts the attainability of such results, is in reality the visionary man, and not the person who proposes them.

I entirely agree with Mr. Mushet that Mr. Allen falls far short of the mark in proposing a modification or modifications which do not go to the root of the matter. The *root* of the whole matter is, that if steam is to be used economically, you must have it of a very high pressure; that if you have it of a very high pressure, your present boilers are not admissible. This Mr. Craddock has clearly seen and provided for by a boiler which is entirely free from any liability to burst at pressures far beyond any now employed. The form of boiler used by Mr Craddock necessitated the employment of

water not liable to sediment; and this he has accomplished by condensing the steam, and using over again the condensed water. It cannot then be for a moment doubted that Mr. Craddock's mode of carrying out the principle is far preferable to that proposed by Mr. Allen, and which seems to me rather a clumsy way of dealing with the matter.

There is another class of engines to which Mr. Craddock's form is less applicable. I mean the very large class of engines used in small manufactories and for various other purposes, where an engine of from 5 to 20 horse-power only is wanted. This class of engine comprises a very large part of the steam power employed in England. The number of small engines employed in our manufacturing towns, in our coal-fields, and for agricultural purposes, is almost beyond calculation. The per centage of saving to be effected in this class of engines is almost as great as that which can be made in the larger class, and it is very much to be desired that the manufacturers of steam engines should devote especial attention to their improvement. All refinements should be laid aside altogether, and attention directed to the employment by the simplest means possible of steam of very high elasticity, and to the realization of the saving which is derivable from its expansion alone. Some of the simple forms of high pressure engine now in use, with the most approved form of D valve, such as is used in locomotives, with an independent cut-off valve worked by a second eccentric for stopping the admission of steam into the valve-box at the desired point, is all that is wanted. The stroke must be quick, and the weight of the fly-wheel considerable, to equalize the irregularity consequent upon the expansion. The working parts of the engine would all be smaller, but stronger than those for an engine of the same horse-power working at a lower pressure. A boiler must be adopted simple in its form, easily cleansed out, and of diminished diameter, so as to bear increased pressure. The cylinder should have a steam jacket, and should, together with the steam pipes, be carefully protected from radiation. By such changes a saving of at any rate 50 per cent. in the fuel consumed by ordinary high-pressure engines would be effected. And as only 50 per cent. of the steam now required would be wanted, the boiler space required would be less than at present, and it is probable that the entire cost of the engine per horse power would not be at all increased, while the economy which would soon be found to be practically obtained, would ensure their general use.

I am quite sure that the object I propose would at present prove a more advantageous one commercially than any more complex and ambitious plans for carrying out the principle, however intrinsically superior the latter might be; and attention would be gradually turned to the most important point —the economy of increased pressure, coupled with expansion.

I would bring under the notice of such of your readers as are not already acquainted with it, an admirable work on the high-pressure steam engine, by Dr. Earnest Alban, a German manufacturer, which contains many excellent hints on the subject. A translation of this work, by Mr. Poole, in two small volumes 8vo, was published in London, by Messrs. Weale, about the year 1851, and is one of the most valuable works we have on the subject.

I am, Sir, yours, &c.,

W. R. WILLS.

Birmingham, Dec. 3, 1855.

ENGLISH STEAM FIRE-ENGINES *v.* AMERICAN BOASTERS.

To the Editor of the Mechanics' Magazine.

SIR,—The *Times* of May, 1854, contained a fulsome account of the Cincinnati steam fire-engine, which was described as the *first* successful application of steam power to that purpose, and as the *only* machine of the kind. The manifest falsehood and injustice of this statement drew forth a well-merited rebuke, which appeared at page 152 of your 61st volume.

In the *Illustrated London News* of November 24th last, the "Cincinnati fire-engine" is again paraded before the British public, and the only wonder is, that any respectable journal could be so far imposed upon, as to publish statements so notoriously false. An *illustration* of a most wretched character is made the peg, whereon to hang the article foisted upon the work referred to; but it illustrates the construction of neither a *steam*, nor any other fire-engine, and is artistically a disgrace to the pages of that paper.

From the description given, it may at least be gathered, that in respect of portability, appearance, performances, and cost, the Cincinnati steam fire-engine, is very far behind those built in London, by Mr. Braithwaite, nearly a quarter of a century before. Nor can the Cincinnati boaster be for one moment compared with the present powerful steam fire-engines on the Thames.

The true history of steam fire-engines has been fully chronicled in the *Mechanics' Magazine;* from whence it has been quoted by Mr. Ewbank, in his celebrated work on hydraulic machines, deservedly popular upon both sides of the Atlantic, notwithstanding the anti-British spirit which occasionally peeps

out. Mr. Ewbank tells us that in 1840, Mr. Ericsson received a gold medal from the Mechanics' Institute of New York, "for the best plan of a steam fire-engine;" the said plan being that of Mr. Braithwaite, of 1830!

It must be matter of deep regret to every true friend of science, to find such misrepresentations so pertinaciously put forth, as is the Barnum-like bombast of the Cincinnati fire-engine.

I remain, Sir, yours, &c.,

W. Baddeley.

13, Angell-terrace, Islington,
Dec. 13, 1855.

ON THE TRISECTION OF ANGLES.

To the Editor of the Mechanics' Magazine.

Sir,—This is a question which no longer occupies the serious attention of men even moderately acquainted with the history of the mathematics, except in so far as it may be worth while to detect and expose the fallacies of those who claim the discovery of its geometrical solution.

Much misconception exists as to what is meant by the term *geometrical solution*. By the Greek mathematicians it has been exclusively confined to the geometry of the line and circle—of the ruler and compasses. All other curves, no matter how easy may be their mechanical description, are excluded. Succeeding mathematicians have followed the Greek interpretation, and have agreed in calling all solutions in which other curves or instruments are used *mechanical*. Whether this name, etymologically, be right or wrong, it is the name which they go by among mathematicians.

If the use of any plane curve which can be geometrically described is to constitute a geometrical solution, as laid down by your correspondent "Cantab," then the question was settled by Nicomedes, who invented the conchoid for this especial purpose some seventeen centuries since. The cissoid of Diocles, and several other curves of the third and higher orders, as well as the cycloid, will answer the purpose. But these are all classed among *mechanical* solutions.

Your correspondent "Microcosmos," who lays claim to a strictly geometrical solution, has not in reality solved the problem at all. It is not easy to see how he establishes his "few equations, to show that it is consistent with a known formula," except in the case of a right angle. Taking his own figure and construction, and dropping a perpendicular from G to meet AB in the point N, and calling ACE (the angle to be trisected) ϕ, we easily find

$$BN : NG :: BA : HA,$$

$$\text{or } 1+\tfrac{1}{2}\cos\phi : \tfrac{1}{2}\sin\phi :: 2 : HA,$$

$$\therefore HA = \frac{2\sin\phi}{2+\cos\phi}.$$

Now, by the construction, HA is made to be the chord of two-thirds of the angle ϕ; *i. e.* $HA = 2\sin\tfrac{1}{3}\phi$.

If we equate these values of HA, we ought to have an identical equation, because if the solution be general, ϕ must be indeterminate. Instead of this, however, we get

$$\sin.\tfrac{1}{3}\phi = \frac{\sin\phi}{2+\cos\phi}, \text{ whence}$$

$$\left\{(2\cos\tfrac{1}{3}\phi)^2-3\right\}(\cos\tfrac{1}{3}\phi-1)\sin\tfrac{1}{3}\phi = 0.$$

The roots of this equation are $\sin\tfrac{1}{3}\phi=0$, $\cos\tfrac{1}{3}\phi=1$ or $\pm\sqrt{\tfrac{3}{4}}$, giving $\phi=0, 90°, 180°$, or $270°$.

It thus appears that these are the only angles which can be trisected by the "solution" given by "Microcosmos." Judging from his diagram, he would appear to have found it out by trial for the case of the quadrant, and assumed it to be true for other values. Any person who has read Euclid's first book will be aware that the trisection of a right angle is no novelty.

I would conclude with a word of advice to those to whom, like "Microcosmos," a problem which has baffled the researches of mathematicians from the days of Plato "appears to be a very simple problem." Before rushing into print, they should take care to ascertain whether their discovery is not a mare's nest.

I am, Sir, yours, &c.,

C. W. Merrifield.

13, Brompton-row, Dec. 17, 1855.

To the Editor of the Mechanics' Magazine.

Sir,—As you have been so kind as to insert my previous note in your valuable columns, perhaps you will permit me to offer you a few remarks on the solution (?) sent by "Microcosmos." Even if his construction were correct, there is no proof that such is the case. For, what is the geometrical meaning of such an expression as $GK = \frac{EI^3}{3}$? Why, that a straight line equals the third of a cube. You might as well say that a beef steak equals the binomial theorem. Analytically, the expression is of course rational; but geometrically speaking, it is nonsense. But independently of the want of proof, the solution is not in itself correct: it is only true for a right angle, which can be trisected much more easily than by this method. To take a simple case:

let the $\angle$ ACE in "Microcosmos's" figure $=45°$; then if this solution is correct, the $\angle$ ACI (if you join CI) $=30°$. Let AC$=r$. Now by the construction AI $=$ AH

$$=2r.\ \frac{\sin 45°}{2+\cos 45°}=2r\ \frac{1}{2\sqrt{2}+1}=\frac{2r}{7}(2\sqrt{2}-1)\ldots\ldots\ldots(\alpha);$$

But since the $\angle$ ACI$=30°$

$$\text{AI}=2r\cos 75°=r\frac{\sqrt{3}-1}{\sqrt{2}}\ \ldots\ldots\ldots(\beta)$$

but (α) and (β) are not equal, and therefore the $\angle$ ACI does not equal 30°; in other words, the angle ACE is not trisected. So that I fear that the problem is not so "very simple" as "Microcosmos" fondly imagines.

May I draw the attention of your readers to an evident mistake on the part of your engraver, in the figure accompanying my solution? The point V, where the circle about T cuts the curve, is omitted, or made to coincide with A, which latter is impossible with any finite angle.

I am, Sir, yours, &c.,

CANTAB.

Dec. 17, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—Your correspondent "Cosmopolitus," is perhaps not aware that the trisection of an angle, the duplication of a cube, and in general, problems depending analytically on the solution of cubic equations, are now considered by analysts as insolvable by rule and compass. Further explanations on this point may be found at the end of the forty-first chapter of "Peacock's Algebra."

I showed (p. 276 of your sixty-first volume) that all problems of this class can be solved graphically by introducing into geometry two new instruments, an angle-trisector and an extractor of cubic roots.

It will, therefore, not be necessary to devise a peculiar instrument for the solution of each particular problem, as was hitherto often done; nor to possess complicated instruments for describing conic sections, since these problems can generally be reduced to finding the intersection of such curves. I shall, perhaps, at another opportunity send you solutions of this kind to a few interesting problems. I will only add here a few propositions connected with the trisection of an angle, to that mentioned by "Cosmopolitus," which I shall recall.

(1.) AB (fig. 1) being a straight line passing through the centre C of a circle, and PDB being a straight line drawn through any point P of the circle, so that the part DB is equal to the radius, we have

$\angle$ PBA$=\frac{1}{3}\angle$ PCA.

(2.) CD (fig. 2) is a radius perpendicular to a diameter ACB of a circle, and from a

Fig. 1.

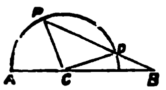
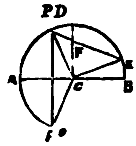


Fig. 2.



point P of this circle, a line PFE is drawn so that the part FE is equal to the radius; then

$\angle$ ECB$=\frac{1}{3}\angle$ ACP.

(3.) If through the centre C of a circle (fig. 3), we draw a radius, CD, parallel to a chord AB, and through B a line BFE, so that the part FE is equal to the radius; then

$\angle$ CBE$=\frac{1}{3}\angle$ ACB.

(4.) CAB is any isosceles triangle (fig. 4);

Fig. 3.

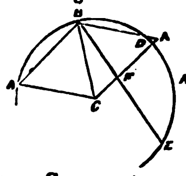
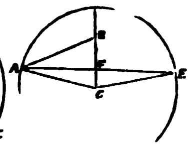


Fig. 4.



from C as centre, with CA as radius, a circle is described; and from A a line AFE is drawn so that the part FE is equal to the radius; then

$\angle$ CAE$=\frac{1}{3}\angle$ CAB.

(5.) Two straight lines AB, CD (fig. 5), meet at right angles at O, and from any

Fig. 5.

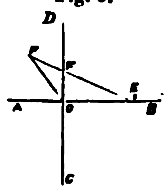
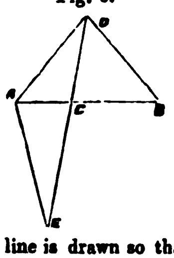


Fig. 6.



point P in $\angle$ AOD a line is drawn so that the part FE contained between OB, OD, is equal to twice OP; then

$\angle$ PEO$=\frac{1}{3}\angle$ POA.

It is interesting to consider the different

relative positions of the given angles and their thirds in the four first cases.' The fifth case is interesting as being independent of a circle.

The proof of (1) we suppose known; that of (2) is found by drawing CD (fig. 1), triangle DCB being isosceles; the proof of (3) is derived from the last mentioned by making (fig. 2) $\angle ACP' = ACP$, since CD will be parallel to PP', and $\angle CPE = \angle CEF = 2\angle ECB = \frac{2}{3}\angle ACP = \frac{1}{3}\angle PCP'$; the proof of (4) is found by drawing BA' parallel to AC (fig. 3), then

$$\angle CBE = \tfrac{1}{3}\angle ACB = \tfrac{1}{3}\angle CBA';$$

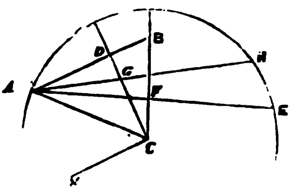
(5) is an immediate consequence of 1 and 2.

Corollary I. Two isosceles triangles (fig. 6) ADB, AEC have their four sides equal, their bases AB, AC in a straight line, and their vertices on opposite sides of AB. One side EC of the one passes through the vertex D of the other; the vertical angle of the first shall be one-third of the vertical angle of the other.

This follows from (4) by drawing CE in fig. 4.

Corollary II. CAB (fig. 7) is an isosceles triangle, and from C, with CA as radius, a

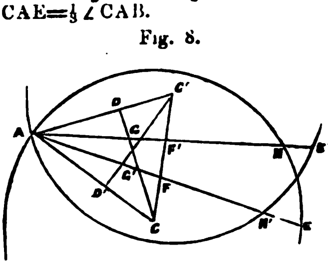
Fig. 7.



circle is described. CD is perpendicular to AB and AFE, AGH are so drawn that FE, GH are equal to the radius; then the lines AE, AH shall trisect the angle CAB. Drawing CK parallel to BA, we have (2),

$\angle CAH = \frac{2}{3}\angle ACK = \frac{2}{3}\angle CAB$; and by 4, $\angle CAE = \frac{1}{3}\angle CAB$.

Fig. 8.

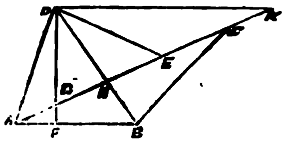


Corollary III. C, C' (fig. 8) are the centres of two equal circles, A is a point common to both, AE, AH trisect the angle CAC'; CD, C'D' are perpendicular to AC', AC; then considering the circle with centre C, we have by corollary II:

$$FE = GH = \text{radius}.$$
$$\text{Similarly } F'E' = G'H' = \text{radius}.$$
$$\therefore F'E' = GH$$
$$FE' - F'H = GH - F'H$$
$$\therefore GF' = HE' = G'F = H'E.$$

Corollary IV. Two isosceles triangles ABC, ADE (fig. 9) have their sides AB,

Fig. 9.



BC, AD, DE equal, the angle DAE of the one double of the angle CAB of the other, and their vertices on different sides of their bases, which are in one straight line. DF is perpendicular and DK parallel to AB. Join DB cutting AK in H. we shall have:

$$GE = AB$$
$$HC = AB$$
$$GK = 2\,AB$$
$$GH = EC$$
$$HE = CK$$
$$DK = AC = AB + AH$$

$GK - DK = AB - AH = HE - AG = CK - AG.$

I am, Sir, yours, &c.,

C. J. RECORDON.

Cambridge, December 1, 1855.

THE FIRE AT THE ALDERSHOT CAMP.

To the Editor of the Mechanics' Magazine.

SIR,—A fire at the camp at Aldershot is what must have been expected by any one conversant with the materials, and the construction employed in the men's huts. It is useless now to repeat all the blunders which have been made in the designs both of the huts individually, and the camp collectively; the excessive inconvenience of the windows, the leakage of the roof, the want of foundation, the neglected drainage, have all been before the public as a "show up" of bad management. And then going a little further into detail, we find the stoves used in the interior of the huts are so constructed that the chimney, which issues out at the top centre, is nearly always something like red-hot, and, at the same time, that tarred felt has been made use of as an external covering. No wonder, then, that the heat becomes a blaze, and the blaze a general conflagration; the only wonder is, that it did not happen long ago, and that the authorities, knowing of the faultiness of the arrangement, did not attempt to alter it.

Why, for instance, should the stove pipe be permitted to reach so high a temperature? Are there no ready means of breaking the conductive power of a metal by an insertion of a lower conductor? Are there no means for enclosing the fiery smoke tube in another, with a surface of sand between? May not the stove be faulty in construction, and wasteful, as they clearly are, of their heat? But none of these points have evidently yet been attended to, and the consequence has been, as might be expected, that there has been a blaze—a confusion—a destruction; and now an inquiry will follow, and the matter will be set right. But why always take Time by the "back-lock" in this way? The faults were as evident before the fire as they are now, and were as remediable; but nothing can be done except under pressure, therefore the public must suffer, to induce them to force the executive to alter. The insertion of a short pipe of fire clay into the top of the stove, as the commencer of the chimney, and connecting it with the iron continuation by an outer casing of iron round it; or, what would be better still, a double iron casing for the whole length, with sand between, would be found to answer the purpose of preventing the dangerous passage of heat to the roof, and inflammable materials of the hut. But it is clear that the stoves themselves are of bad construction, and constructed solely of iron. The introduction of a little fire-clay as a back and bed would moderate the excessive heat, and give out a much more satisfactory warmth than the air-scorching metal.

I am, Sir,
Your obedient servant,
HERBERT C. LLOYD.

Kingston-on-Thames.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

DRAY, WILLIAM, of Swan-lane, London, agricultural implement-maker. *Improvements in the manufacture of frames for all kinds of structures, together with the means of fastening the same when necessary, part of which is applicable to the manufacture of screws and bolts.* Patent dated May 12, 1855. (No. 1078.)

Claims.—The manufacturing of frames for bedsteads, reclining supports, and all kinds of structures of hollow metal, and the constructing of the parts in such manner that they shall fit together without the use of screws as described. 2. The constructing of bedsteads and other similar structures of hollow metal, the various parts thereof being held together as described. 3. The forming of screws and bolts, and other similar articles, of hollow metal as described.

THEROULDE, FRANÇOIS ALPHONSE, of Place Vendôme, Paris, shipowner. *Improvements in preserving animal substances.* (A communication.) Patent dated May 12, 1855. (No. 1079.)

The inventor treats animal substances with "chloride of aluminum, chloride of tin, persulphate of zinc, and the per salts of iron, manganese, antimony, and tin." Also with "chloride of sodium, potassium, or ammonium, mixed with the sulphate of iron, manganese, zinc, or antimony."

DUPRE, JOHN, of Plymouth. *Improvements in the construction of ovens.* (A communication.) Patent dated May 12, 1855. (No. 1081.

In constructing an oven, the inventor prefers that the base should be rectangular, the fire bars being arranged in the centre. "There is a fire-door in front and a flue from the back end of the fire bars, under part of the oven which opens into an upright flue, which leads to the chimney, and it is provided with a damper." The bottom of the oven has an opening in the centre over the fire bars, and in the bottom, near the centre, there are passages through which air circulates and becomes heated and is then admitted into the oven, being regulated by valves. The roof of the oven is convex outside and concave inside, and it has in it four openings communicating with flues above, and by them with the upright flue leading to the chimney. These openings have regulating valves.

ROBERTSON, WILLIAM, of Edinburgh, Scotland, iron founder. *Improvements in the treatment of fuel, and its use for heating purposes.* Patent dated May 14, 1855. (No. 1083.)

In this invention (for making coke and heating simultaneously) "the furnace or oven in which the fuel is contained has a sliding top or crown, by means of which the heating of the furnace is retained within it as required for the process of coking the coal, and passes into flues leading to a boiler, the preparation of coke still continuing."

PETTIGRUE, JAMES, of Drumcree, Westmeath, gentleman, and Dorset-street, Dublin. *Improvements in propelling vessels.* Patent dated May 14, 1855. (No. 1084.)

This invention relates to propelling by means of a solid piston or plunger contained within a cylinder open to the admission of water to be pressed or thrust against by the piston, and consists in the use of certain mechanism for communicating the required motion to the propellers employed.

MCCONNEL, ROBERT, of Glasgow, Lanark,

iron-founder. *Improvements in beams or girders for building or structural purposes.* Patent dated May 14, 1855. (No. 1085.)

This invention primarily consists in a mode of forming beams or girders "wherein two parallel or nearly parallel malleable iron bars, straps, or narrow plates are connected together with distending or stay pieces of wood or cast-iron, and with spaces for tranverse joists."

MORRISON, ROBERT, of Newcastle-upon-Tyne, engineer. *Improvements in steam engines.* Patent dated May 14, 1855. (No. 1086.)

This invention consists in a mode of balancing the moving parts of vertical-cylinder direct-acting engines, by means of pistons connected to such moving parts, and subjected to an upward steam pressure acting against a vacuum.

BUCHANAN, JAMES, of Glasgow, Lanark, gentleman. *Improvements in the manufacture of heddles or healds for weaving.* (Partly a communication.) Patent dated May 14, 1855. (No. 1087.)

This invention primarily relates to various improvements upon the machinery for making heddles or healds for which D. Anderson and J. Berrie obtained Letters Patent on the 25th of March, 1835.

EASTWOOD, THOMAS CHARLES, and THOMAS WHITLEY, of Bradford, York, overlookers. *Improvements in preparing and combing wool and other fibrous substances.* Patent dated May 14, 1855. (No. 1088.)

These improvements "relate to means of working combs used as carrying and holding combs between suitable feed means and receiving combs, in connection with means of using such receiving combs."

MASON, JOHN, machinist, SAMUEL THORNTON, machinist, and LEONARD KABERRY, manager, of Rochdale, Lancaster. *Improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning yarns or threads, and for finishing or polishing such yarns or threads.* Patent dated May 14, 1855. (No. 1089.)

Claims.—1. Constructing the cover ends or "bends" of carding engines with apertures, or otherwise arranging them so as to allow the grinding apparatus to pass. 2. Forming the inside of the feeder so that it shall coincide with a portion of the circumference of the "taker in." 3. In reference to polishing yarns, covering the heated chest or chests with cloth, yarns, or other soft substance.

ROBERTSON, ALEXANDER, of Sheffield, York, stove grate manufacturer. *Improvements in the construction of stoves and fire-grates.* Patent dated May 14, 1855. (No. 1090.)

This invention primarily consists in casting the hearth-plate (when constructing open stoves or fire-places) in one piece with the grating and with the frame, and also, if required, with the cheeks of the stove.

NEWALL, ROBERT STIRLING, of Gateshead. *Improvements in apparatus employed in laying down submarine electric telegraph wires.* Patent dated May 14, 1855. (No. 1091.)

In carrying out this invention the cable containing the insulated wires is passed round a cone (or, if it is long, round several cones), so that in being drawn off the coil it is to be prevented from kinking by means of the cone; and there is a cylinder on the outside which prevents the coil from shifting in its place. The cable passes over a pulley above the cone, and on to a break-wheel, round which it takes several turns, and is then led over the stern of the vessel.

GARRETT, ALFRED CHARLES, of Massachusetts, U.S. *Facilitating the work of lubricating the axles or bearings of carriage wheels.* Patent dated May 14, 1855. (No. 1092.)

This invention consists in the extension of the screw nut or plug of the oil passage down to, or nearly to, the bearing of the journal of the axle, and also in providing the screw plug with a chamber for the reception of the oil, and for receiving the thickened wheel grease which may accumulate, and for the purpose of enabling a person to remove the latter, &c.

HILL, LEVI LEWIS, of Westhill, New York, U. S. *Improvements in silvering glass.* Patent dated May 14, 1855. (No. 1093.)

In this invention the solution or chemical compounds is applied to the glass in an India-rubber implement suited to the size and shape of the glass.

BOUSFIELD, GEORGE TOMLINSON, of Sussex-place, Brixton, Surrey. *An improvement in burning hydro-carbons in lamps.* A communication. Patent dated May 14, 1855. (No. 1095.)

Claim.—The employment of granulated pumice-stone as a packing for spirit lamps, and other vessels containing any inflammable hydro-carbon.

CHRISTIE, PETER, of Greenock, Scotland. *An improved tent or hut for soldiers in the field, emigrants, tourists, and other persons requiring a portable dwelling.* Patent dated May 15, 1855. (No. 1096.)

In this tent no poles are used, the tent cover being supported by a rigid framework which is easily put together and taken apart. The lower part of the framework supports a wooden flooring elevated 18 inches above the ground. Each of the flooring pieces is made so as to turn over and form a bed by night.

JOBSON, ROBERT, of Holly-hall Works, near Dudley, Stafford, iron-founder; and JOHN JOBSON, of Litchurch Works, near

Derby, iron-founder. *Improvements in the manufacture of moulds for casting metals.* Patent dated May 15, 1855. (No. 1097.)

This invention mainly consists in manufacturing moulds for casting balls or bullets by means of a series of three or more loose pattern balls or bullets, arranged in a series of holes in a plate, and resting loosely upon another plate, or upon a series of supports all in the same plane, and so arranged that the patterns may detach themselves from the mould by their own weight, while the mould is raised or supported by the perforated plate.

FAWCETT, WILLIAM JOHN LAMB, and FRANCIS BEST FAWCETT, of Kidderminster, Worcester, carpet manufacturers. *Improvements in the manufacture of carpets and other similar fabrics, and in machinery and apparatus to be used therein.* Patent dated May 15, 1855. (No. 1098.)

This invention consists in raising the figure warp only half the usual number of times, in order to remove every other shute from the back of the fabric, and thereby better bind in and strengthen the pile surface—in a mode of raising the whole figure warp or worsted for the shuttle to go on the back of the cloth, by an arrangement of parts in connection with the trap-board, or its equivalent in the jacquard—in raising or depressing the figure warp by giving the requisite rising and falling motion to the jacquard machine—in a mode of arranging the bows or heads of the pile wires in combination with a guide attached to the side of the loom, in order to secure their accurate arrangement during the insertion of them into the work, &c., &c.

BOUSFIELD, GEORGE TOMLINSON, of Sussex-place, Brixton, Surrey. *Improvements in the manufacture of wrought nails.* (A communication.) Patent dated May 15, 1855. (No. 1099.)

This invention consists in the employment of cutters to form tapered pieces by cutting from a plate rolled to the thickness of the thickest part of the shank of the nails, and making the taper alternately from the opposite sides. Gripping or moulding dies receive the pieces from the cutters and mould them, by causing the metal to spread instead of elongating.

LATHAM, WILFRID, of Liverpool, Lancaster, merchant. *Improvements in cutting the terry or pile of certain textile fabrics used for saddle covers.* Patent dated May 16, 1855. (No. 1101.)

Claim.—Cutting the terry or pile of "Pellones" with any cutting instrument having a lateral movement given to it, so as to cut or chafe the loops asunder in unequal lengths.

RICHARDSON, THOMAS, of Leeds, York, drysalter and manufacturing chemist. *An improvement in dyeing cloth.* Patent dated May 16, 1855. (No. 1102.)

To produce a permanent black dye in woollen cloths the inventor "mordants the cloths with bicarbonate of potash, and then submits them to a bath composed of sulphate of indigo and other suitable dyeing materials."

NORMANDY, ALPHONSE RENE LE MIRE DE, analytical chemist, of Judd-street, Brunswick-square, Middlesex. *Certain improvements in converting fatty and oily substances into fatty and oily acids, and into soap.* Patent dated May 16, 1855. (No. 1103.)

We shall give a full description of this invention hereafter.

PLENTY, EDWARD PELLEW, and WILLIAM PAIN, of Newbury, Berkshire, agricultural implement manufacturers and copartners. *An improvement in ploughs.* Patent dated May 16, 1855. (No. 1104.)

In this invention the wheel-stalk is formed in two divisions,—the lower part consisting of a plain square stem, and the upper part being a screw—and passes through two apertures in a forked guide attached to the plough-beam. The lower aperture is a square hole through which the wheel-stalk slides, while the upper end carries a revolving nut and handle. On turning this handle the nut rotates, and the wheel is raised or lowered.

SIEMENS, CHARLES WILLIAM, of John-street, Adelphi, Middlesex, civil engineer. *Improvements in cooling and in freezing water and other bodies.* Patent dated May 16, 1855. (No. 1105.)

This invention primarily consists in causing water gradually to percolate through, or flow over or against, a mass or quantity of crystalline chloride of calcium or other suitable chemical salt or compound, and so form a strong solution of the chloride or compound, and absorb or abstract the heat from the bodies to be frozen or cooled.

VEZEY, ROBERT, and EDWARD VEZEY, of Bath, Somerset, coach builders. *Certain improvements in carriage steps.* Patent dated May 16, 1855. (No. 1108.)

This invention consists in an arrangement of mechanism to be operated upon by the movement of the carriage door for the purpose of opening and closing the step.

KNOWLES, JOHN, of Manchester, Lancaster, marble merchant, and EDWARD TAYLOR BELLHOUSE, of the same place, engineer. *Improvements in the manufacture or working of marble, stone, glass, or similar materials.* Patent dated May 16, 1855. (No. 1110.)

In this invention the stones or other substances employed in preparing the surfaces

of marble, stone, or glass, are cemented diagonally into boxes, and several of these boxes, each containing a stone, are fitted loosely inside suitable compartments in a larger box or carrier. At the top of each compartment of the latter is fitted a piece of vulcanized India-rubber or other elastic material, to come between the tops of the smaller boxes and the carrier.

RYE, WHARTON, of Miles Platting, near Manchester, Lancaster, iron-founder. *An improved railway wheel, which may also be employed for other similar purposes.* Patent dated May 16, 1855. (No. 1112.)

The inventor forms a wheel by the combination of wrought-iron plates and cast-iron, the plates being perforated and inserted in the boss and rim of the wheel, so as to allow the metal used for casting the rim and boss to pass through the perforations of the plates, and thus firmly combine the rim-plates and boss in one mass.

DAWSON, THOMAS, of King's Arms-yard, London, engineer. *Improvements in cases for containing pen, ink, and stamps.* Patent dated May 17, 1855. (No. 1113.)

Claim.—"The improved construction and arrangement of cases, by which I am enabled to combine in the same case a pen, reservoir for ink, an ever-point, and chamber for containing postage or receipt stamps as described."

MENNET, ALEXANDRE MAXIMILIEN, merchant, of Paris, French Empire. *Certain improvements in ornamenting textile and other fabrics.* Patent dated May 17, 1855. (No. 1114.)

This invention consists in ornamenting fabrics, particularly wearing apparel, with real or artificial stones, gems, porcelain, and all substances in relief, by uniting them with cement, rivets, screws, sewing or other suitable means.

BUTT, JEAN GUILLAUME, and JEAN ALFRED MARTIN, of Paris, France. *A new system of rotary steam engines.* Patent dated May 17, 1855. (No. 1115.)

The new engine consists of a cylinder cast with two long trunnions turning in bearings fixed on a framing, which also carries in the same line as the axis of the trunnion a fixed wheel. On each side of the cylinder is an oblong framing, bearing at one end blocks which receive an elbowed shaft to which the cam is fixed, the same shaft also carrying at its end a wheel, which gears into the wheel fixed on the framing. At the other end of the oblong framing are two slides, in which move the rollers of a cross-piece to which the piston-rod is fixed, and from which motion is imparted to the elbowed shaft by means of two connecting-rods, which connect the cross piece to the cranks of that shaft, and which are on either side of the cylinder. Upon the admission of steam through the stuffing-box of the trunnions the piston works the elbowed shaft by means of the connecting-rods; the moveable wheel gears into the fixed wheel, and the whole system is set in motion.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in the manufacture, treatment, and application of oily, resinous, and gummy substances, and soaps.* (A communication.) Patent dated May 17, 1855. (No. 1116.)

To a quantity of rosin oil is added 25 per cent. of turpentine with about 5 per cent. of catechu, and sufficient starch to give the necessary consistence to the mass, which is then mixed with hot gutta percha.

BLYTH, FREDERICK DELACOURT, of Birmingham, Warwick, manufacturer. *Improvements in the manufacture of tea-trays, picture-frames, and other similar articles from papier-maché.* Patent dated May 17, 1855. (No. 1117.)

This invention mainly consists in employing certain blocks of wood or metal between the dies or forms in which the papier-maché is moulded, so as to facilitate the distribution of pressure over their surfaces.

RAE, JAMES, of Alpha-road, New-cross, Kent, engineer. *Improvements in warming railway passenger carriages and compartments in steam vessels.* Patent dated May 17, 1855. (No. 1118.)

This invention consists in applying the heat of the boiler or engine to the warming of air by means of tubes fitted for the purpose.

MINIÉ, CHARLES CLAUDE ETIENNE, of Paris, France. *Improvements in breech-loading fire-arms.* Patent dated May 18, 1855. (No. 1121.)

Claims.—1. The use of a swivelling piece, by which a certain implement is made to slide and fix the arm solidly. 2. "The principle which allows the cartridge to be put in a recess, without requiring its being inserted in the barrel."

MOREWOOD, EDMUND, and GEORGE ROGERS, of Enfield, Middlesex. *An improvement in coating wrought iron.* Patent dated May 18, 1855. (No. 1123.)

This invention consists in subjecting wrought iron to solutions of tin, in order to obtain depositions therefrom, and in then coating it with varnish or japan, or with melted resinous, gummy, oily, or bituminous matters.

GRANVILLE, WILLIAM HENRY DEARING, of Stokenchurch, Oxford, schoolmaster. *Improvements in fire-arms, and cartridges for the same.* Patent dated May 18, 1855. (No. 1125.)

This invention mainly consists in the construction of a stock which is made to open so as to receive the chambers in which the cartridges are contained, and which consist of tubes rotating on a centre, and furnished with end plates and a click and ratchet. The cartridges are placed in the chambers, and pressed forward by spiral springs placed at the end of the tubes.

STAINTON, ROBERT JOHN, and EDMUND CHARLES DAVEY, of Holland-street, Blackfriars-road, Southwark, iron plate workers and stove-manufacturers. *Improvements in the construction of warming and other stoves for generating and radiating heat, and also for economizing combustion therein and attention thereto.* Patent dated May 21, 1855. (No. 1126.)

In the improved stoves the heated gases generated by the combustion of the fuel ascend through flues to the top or hot air chamber, and then descend and circulate within the body of the stove around the fuel chamber (or, in the gas stove, around the air shaft), afterwards passing off into the chimney.

TUCKER, WALTER HENRY, of Fleet-street, London, lock-manufacturer. *Improvements in locks.* Patent dated May 21, 1855. (No. 1127.)

In certain locks and latches the inventor attaches a combination stump to the barrel or curtain, in such a position that any instruments placed into and turned in the locks must be carried past and away from the combination security parts, before the barrel and curtain can be turned so far round as to bring the combination stump which is attached to them into contact with or to press upon the combination security parts, &c.

WATSON, HENRY HOUGH, of Little Bolton, Lancaster, analytical chemist, and JAMES OLIVER, of Over Hulton, land-agent. *Improvements in the manufacture of fuel.* Patent dated May 21, 1855. (No. 1129.)

Claim.—"The mixing with coal intended to be burnt into coke of a proportion of coke alone, or of coke and coal mixed together, and afterwards burning or converting the whole mixture into coke."

NICHOLLS, BENJAMIN, of East-street, Old Kent-road, Surrey. *Improvements in the manufacture and construction of buttons.* Patent dated May 21, 1855. (No. 1130.)

Claim.—Making buttons of gutta-percha.

DIDOT, PAUL FIRMIN, chemist, of Paris, French empire. *An improved process of bleaching paper pulp, textile fabrics, and other substances or matters.* Patent dated May 21, 1855. (No. 1131.)

Claim.—The bleaching of paper pulp, textile fabrics, and other substances, by mixing them with chloride of lime or other bleaching chloride, or immersing them in a solution of the same, and passing carbonic-acid gas through the mixture.

STOCKER, SAMUEL, of Brighton, Sussex, engineer. *Improvements in machinery, and apparatus for shaping of metals, and also in such metal goods made from sheets, plates, or tubes; and also for other parts connected therewith; and for finishing the same when left by the machine or apparatus.* Patent dated May 21, 1855. (No. 1132.)

"What I claim," says the patentee, "is machinery for producing of various-shaped articles made from tubes. And I would have it understood that many ways may be resorted to for this purpose, both by hand tools and machinery, both of which I claim. And also I claim the applying such shaped articles, made from tubes or plates of metal, separate, or in connection with any other goods, and also the use of gutta-percha if necessary."

MOWBRAY, FREDERICK WILLIAM, of Shipley, near Leeds, York, engineer. *Improvements in looms for weaving carpets and other pile fabrics.* Patent dated May 21, 1855. (No. 1133.)

This invention mainly consists in arranging and operating parts of looms for weaving pile fabrics, "whereby pile wires may be used longitudinally of the fabric, in the production of the pile loops thereto, when the selection for the particular pile warp for the time required to form the pattern or figure to such fabric is obtained, as in the manufacture of Brussels carpets, by jacquard or other pattern surface."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

RICKETT, THOMAS, of Watling Works, Stony Stratford. *Improvements in the construction of pressure-gauges.* Application dated May 12, 1855. (No. 1080.)

In this invention a disc of metal is confined fluid-tight between two plates, the under of which is connected to a steam pipe, while the upper is connected with a graduated scale. In a small chamber above the disc is placed quicksilver, which, as the steam presses on the disc, rises up a passage faced with glass in connection with the chamber.

HIGGINS, JOHN, of Oldham, Lancaster, engineer. *Improvements in steam boilers and apparatus connected therewith.* Application dated May 14, 1855. (No. 1082.)

This invention consists in fitting boilers with transverse and vertical tubes. Also in

making the furnace or fire-place bars and bridge in one frame-work, and connecting it to the door frame, the whole being made hollow, and having the water passed through it on its way to the boiler.

LACKMANN, JOHN, of Hamburg. *An improvement in the manufacture of sheet iron.* (A communication.) Application dated May 14, 1855. (No. 1094.)

The inventor in preparing iron similar to Russian sheet iron, rolls the best kind of charcoal iron into sheets, which he then anneals, and planishes on a polished anvil by a polished hammer.

SAXON, GEORGE, of Openshaw, near Manchester, engineer. *Improvements in the construction of safety-plugs for steam-boilers, and in valves for steam-engines.* Application dated May 16, 1855. (No. 1100.)

The improvements in safety-plugs consist in securing a plate of fusible metal between two metal bushes, one of which is fixed in the boiler: and the improvements in valves consist in making the guides of ordinary seat-valves, with connecting webs, in order to obtain small apertures for the passage of steam, when the valve is first opened, which apertures are gradually enlarged as the valve rises.

JAMIESON, ROBERT, of Ashton-under-Lyne, Lancaster, machinist. *An improved machine, or improvements in machinery or apparatus, for forming or forging the burrs or nuts for screw-bolts; applicable also to forming, forging, or completing blanks for bolts, and pieces of metal for other purposes.* Application dated May 16, 1855. (No. 1107.)

This improved machine is furnished with a shaft, on which is fixed a cam or eccentric which actuates a slide, as in the punching and shearing machines in common use. This slide has fixed upon it two punches, which act simultaneously on the bar of metal; the first being cylindrical, and punching the holes in the burrs or nuts, and the second corresponding in form to the external shape of the burr or nut. These punches have each their corresponding dies.

PORTER, JOHN HENDERSON, of Birmingham, Warwick, engineer. *Improvements in coupling-blocks for trusses employed in roofs and other structures generally.* Application dated May 16, 1855. (No. 1109.)

In this invention, the ties to be coupled are passed entirely through a cast-iron block, and are tightened up on opposite sides of it, so that their strains will tend to compress the block.

MURDOCK, ROBERT, of Cran-hill, Glasgow, Lanark, surveyor. *Improvements in agricultural apparatus for sowing seeds, and for depositing manure.* Application dated May 16 1855. (No. 1111.)

The main feature of these improvements is the use of glass chambers, or vessels for containing the seed or the manure, in order that the operator may watch the action of the apparatus.

SMITH, WILLIAM, of Salisbury-street, Adelphi, Middlesex. *A new machine for cleaning cotton and other fibrous materials.* (A communication.) Application dated May 17, 1855. (No. 1119.)

This machine consists of a combination of pricks and brushes which open the cotton, and cause the dust, &c., to be easily separated and drawn away by the action of a fan.

WARÉE, BENOIT THEODORE, of Paris, France. *A new or improved apparatus for sharpening pencils.* Application dated May 18, 1855. (No. 1120.)

This apparatus consists chiefly of a "suitably cut, straight, sectorial, annular, and wheel-like file," to which a "respectively straight, reciprocating motion, or a circular to-and-fro motion, or (for the annular wheel or barrel file) a continuous rotary motion is imparted with respect to the pencil."

JEFFREYS, JULIUS, of Kingston, Surrey. *Improvements in sun-blinds or solar screens.* Application dated May 18, 1855. (No. 1122.)

The inventor uses a succession of light frames, suspended horizontally one above the other, and each consisting of an inner rod next the window, and an outer one from six inches to a foot from the former, the two being connected by cross and diagonal pieces. From the inner bar of each frame a breadth of cloth is stretched to the outer bar of the frame next below it.

CUMMING, JOHN, of Glasgow, Lanark, pattern designer. *Improvements in looms for weaving.* Application dated May 18, 1855. (No. 1124.)

This invention relates to a series of contrivances more particularly applicable for weaving in a circle, or continuously, by means of shuttles travelling round warps arranged in a circle; but the arrangements may be so modified as to render them suitable for weaving with a reciprocating shuttle, its line of traverse being either partially circular or rectilinear.

EASSIE, PETER BOYD, of Gloucester, civil engineer. *A sectorial or radial ellipsograph.* Application dated May 21, 1855. (No. 1128.)

This instrument consists of a pillar fastened to a base plate, and adjusted in position by three indexes setting out the conjugate and transverse axis of the intended ellipse. This pillar carries a moveable arm, which is adjusted by a pinion working in a rack sunk on one side of the pillar, and the

outer end of the arm terminates in a ring which receives a universal joint, through which a pen or pencil works.

PROVISIONAL PROTECTIONS.

Dated October 19, 1855.

2342. William Tatham, of Rochdale, Lancaster, machine maker. Improvements in machinery or apparatus for preparing, spinning, doubling, and winding cotton, wool, flax, silk, or other fibrous substances.

Dated October 22, 1855.

2359. Alexander Parkes, of Burry Port, Llanelly, Carmarthen. Certain preparations of oils for, and solutions used when waterproofing, and for the manufacture of various articles by the use of such compounds.

Dated October 23, 1855.

2369. John Bellamy, of Lower-road, Islington, Middlesex. Improvements in graining and in producing imitative ornamental surfaces, and in certain instruments or apparatus to be employed for such purposes.

Dated October 29, 1855.

2409. Thomas Ato Temperton, of Manchester, factor. Certain improvements in shells and rockets, and other projectiles of a like nature.

Dated November 6, 1855.

2495. Edward Jeffreys, of Shrewsbury, engineer. An improvement in the construction of furnaces.

Dated November 7, 1855.

2512. Henry John Betjemann, of New Oxford-street, Middlesex. Improvements in expanding or extending tables. Partly a communication.

Dated November 12, 1855.

2535. William Crosley, of Westbourne-park, Middlesex, and Southwark Bridge-road, Surrey, gas meter manufacturer. Improvements in gas meters.

2537. Louis Joseph Frédéric Margueritte, chemist, of Paris, France. Certain improvements in the manufacture of vitreous products.

2539. William Kemble Hall, of Cannon-street, London, engineer. Improvements in boilers for generating steam. A communication.

2540. George Cooke, of Kersley, Lancaster, spindle maker. Improvements in flyers used in roving and slubbing frames.

2541. Thomas Hitt, of Tavistock-street, Westminster, gentleman. A new method of obtaining power for propelling vessels and certain new propelling machinery.

2543. William Henry Aston and Samuel Hopkinson, of Zetland Mill, Huddersfield. Improvements in steam boiler furnaces and apparatus employed for supplying water to steam boilers.

2545. Andrew Barclay, of Kilmarnock, Ayr, engineer. Improvements in indicating the pressure of steam and other fluids, which improvements are also applicable to governors and other regulating apparatus.

2547. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture or preparation of hard India-rubber and in the application thereof to the construction of parts of textile and other machinery. A communication from Henri Victor Wacrenier, of Paris, France.

2549. William Henson, of Bryan-street, Caledonian-road, Middlesex, engineer, and Henry Oscar Palmer, of Castle-street, Marylebone, surveyor. Improved apparatus for propelling vessels.

Dated November 13, 1855.

2551. Fischer Alexander Wilson, of Adelphi chambers, London, gentleman. Improvements in engines, machinery, and apparatus for exhausting, forcing, lifting and for propelling on land and water.

2553. John Wilkinson the elder, and John Wilkinson the younger, of Leeds, York, felted cloth and carpet manufacturers. Improvements in communicating a shape or configuration to felted cloths and other manufactured fabrics.

2555. John Mawson, of Newcastle-upon-Tyne, Northumberland, chemist. Improvements in cameras for taking photographic pictures.

2557. Robert Murdoch, of Cran-hill, Glasgow, Lanark, surveyor. Improvements in agricultural apparatus for sowing seeds and depositing manure.

Dated November 14, 1855.

2559. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, sworn interpreter, imperial court of Paris. Certain improvements in producing ice. A communication from Louis Joseph Frédéric Margueritte, of Paris, France.

2561. James Burrows, of the Haigh foundry, near Wigan, Lancaster, engineer. Improved apparatus for winding coals or other minerals from mines, which said apparatus is also applicable for other similar purposes, and for machinery required for forming or constructing such improved apparatus.

2563. William Barnes, of Royal Exchange-buildings, London. An improvement in connecting and supporting the ends of the rails of railways.

2565. Joseph Robinson, of Denton-mills, Carlisle. Improvements in machinery for drying wheat and other grain.

2567. Charles Goodyear, of Avenue Gabrielle, Paris. Improvements in shoes and boots when India-rubber is used.

2569. Frank Jacques, of Droylsden, Lancaster, silk dyer. The use and method of preparation of a new material to be used in the process of dyeing silk.

2571. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved manufacture of electrotype printing surfaces. A communication.

2573. Johannes Möller, of Maynard-place, Hornsey, Middlesex, esquire. Producing a transparent photographic picture on ivory, without injuring the nature of the ivory, so as to be able to finish the picture with colours like other miniatures.

Dated November 15, 1855.

2575. Franz Duncker, of King William-street, Strand. A new instrument for electric telegraphs, called "Despatch Distributor," which will permit despatches of various contents being communicated at the same time to one or more stations by means of one or two line wires only. A communication from Mr. A. Bernstein, of Berlin.

2579. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in carding engines for carding cotton and other fibrous materials. A communication from George Wellman, of Lowell, United States.

2581. George Tomlinson Bousfield, of Sussex-place, Loughboro'-road, Brixton, Surrey. Improvements in breech-loading fire-arms. A communication.

Dated November 16, 1855.

2583. Benjamin Talbot Babbitt, of New York, United States. Manufacturing soap.

2585. William Eassie, of Gloucester, railway contractor. Improvements in hammers.

2587. James Yates, of Birmingham, Warwick, manufacturer, and Thomas Rawlins Birch, of Birmingham, manufacturer. An improvement or improvements in engines for raising beer and other liquids.

2589. Edward Peyton and Duncan Morrison, of Bordesley Works, Birmingham. Improvements in manufacturing parts of metal bedsteads.

2591. Louis Auguste Petard, draughtsman, of Paris, French Empire. Certain improvements in manufacturing velvet and other similar fabrics.

Dated November 17, 1855.

2593. Joseph Denton, of Pendleton, near Manchester, Lancaster. Improvements in looms.

2595. Robert Walter Swinburne, of South Shields, Durham, plate glass manufacturer. Improvements in furnaces used in the manufacture of glass.

2597. George Collier, of Halifax, and James William Crossley, of Brighouse, York. Improvements in means or apparatus employed in hot-pressing woven fabrics, and other surfaces.

Dated November 29, 1855.

2692. Arthur William Forde, of Bernard-street, Russell-square, London. Registering the number of revolutions of a wheel of a locomotive engine, or railway or other carriage, at any given period.

2694. William Irlam, of the Gibraltar Ironworks, Newton-heath, Manchester, engineer. Improvements in crossings for railways.

Dated November 30, 1855.

2700. John Ramsbottom, of Accrington, Lancaster, engineer, and John Charles Dickinson, of Blackburn, machine-maker. Improvements in machinery or apparatus for measuring and registering water and other fluids, and obtaining motive power from the same.

2702. Edward Daniel Johnson, of Wilmington-square, Middlesex, watch-manufacturer. An improvement in the construction of attachable seconds watches.

2704. Richard Hancock, of Great Polgooth Mine, St. Austell, Cornwall. Cleaning and separating ores of every description when brought into a state of low pulverization.

2706. Samuel Cunliffe Lister, of Bradford, York. Improvements in treating so as to rework waste yarns of cotton, silk, flax, wool, or other fibre.

Dated December 1, 1855.

2708. William Ward, of Warrington, Lancaster, spinner and manufacturer. Certain improvements in looms for weaving.

2712. James Murdoch Napier, of York-road, Lambeth, Surrey. An improvement in drying small coal.

Dated December 3, 1855.

2714. George Harrison, of Burnley, Lancaster, overlooker, and William Mitchell the younger, of Hoarstone-lodge, near Burnley, wool stapler. Improvements in machinery for roving, spinning, and winding worsted, cotton, and other fibrous materials.

2716. Christian Mayer, of New York, United States. Improvements in hair trigger locks for fire-arms.

2718. Westley Richards, of Birmingham, Warwick, manufacturer, and Joseph Rock Cooper, of Birmingham, manufacturer. An improvement or improvements in breech-loading fire-arms.

2720 Jules Roth, of Mulhouse, French Empire, now at Manchester, Lancaster, chemist. An improvement in rollers employed in spinning-machinery, and in other parts of machinery used in the treatment of fibrous materials.

2722. James Leitch, sugar-refiner, of Ellenborough-street, Liverpool, Lancaster. Certain improvements in melting and blowing up sugars.

Dated December 6, 1855.

2742. Charles Hawker, of Fishbourne, Isle of Wight, salt-manufacturer, and Thomas Parry Hawker, dispenser of medicine, war prison, Plymouth. An improved method of manufacturing cartridges.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2747. Ebenezer Poulson, of Judd-street, Brunswick-square, Middlesex, marine artist. A new constructed engine to be worked either by steam or principally by manual labour. December 6, 1855.

2792. Jacques Elidat de Malbec, of Paris, France, and Duke-street, Adelphi, London. Certain improvements in water-closets. December 11, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December 18th*, 1855.)

1779. Fischer Alexander Wilson. A portable cooking apparatus, suitable for campaigning purposes.

1780. John Platt and John Hibbert. Improvements in mules for spinning and doubling, which improvements are also applicable to other machines in which clutch-boxes are used.

1781. Henri Auguste Pradel. Certain improvements in twisting textile goods or fabrics. A communication.

1790. William Mitchell Tileston. Improvements in machinery for ruling paper. A communication.

1801. Edward Cooke. An improvement or improvements in moulds used in casting certain parts of metallic furniture.

1807. William Bridges Adams. Improvements in locomotive engines and their trains.

1809. Alfred Heaven. Improvements in machinery for embroidering fabrics.

1813. Joseph Betteley. Improvements in the manufacture of ships' chain cables.

1814. Edward Finch. Improvements in machinery for discharging coals, minerals, and other materials from railway, tramway, and other waggons.

1815. Edward Finch. Improvements in machinery for loading and unloading coal and other vessels.

1817. John Lee Stevens. Improvements in steam boilers.

1818. Philippe Latour and Maurice Latour. An improved machine to be used for cutting nails and driving them into the shoe.

1820. George Rose Innes. Improvements in raising and lowering rolling blinds. A communication.

1825. James Gardner. Improvements in the manufacture of salt.

1829. Alexander Cameron Morrison. An improved compound or mixture for feeding horses and other cattle.

1832. William John Gregory. Improvements in the construction of camp furniture.

1835. Ebenezer Daggett Draper and George Draper. An improved vessel or can for oiling machinery. A communication.

1841. Gilbert Sanders and Richard Edward Donovan. Improvements in maintaining the level of the water or other liquid in gas-meters and steam boilers, and regulating or controlling the action of such apparatus.

1850. Alfred Vincent Newton. Improved ma-

chinery for manufacturing railroad chairs. A communication.

1856. Joachim Hayward Stocqueler and William James Buchanan Saunders. Improved mechanical means for obtaining elevations.

1873. Edward Heys. Improvements in flyers used in preparing and spinning cotton and other fibrous materials.

1886 Pierre Gontier. Improvements in treating linseed, poppy, and other oils employed in the mixing of paint.

1922. John Avery. Improvements in handles for augers, gimlets, and other tools and instruments to which such handles may be applicable. A communication.

1923. John Avery. Certain new and useful apparatus for exhausting and closing vessels. A communication.

1924 John Avery. Automatic attachments to be applied to gates and doors. A communication.

1925. John Avery. Improvements in sewing-machines. A communication.

1932. François Rualem. A new process for manufacturing fuel for household and general purposes, called "the imperial coal."

1941. William Johnson. Improvements in railway breaks. A communication.

2019. James Fraser. An improvement in the manufacture of paper. A communication.

2349. William Field and Edward Jeffreys. Improved means for securing the rails of railways in their chairs or bearings.

2350. Alexander Parkes. Certain preparations of oils for, and solutions used when waterproofing, and for the manufacture of various articles by the use of such compounds.

2369. John Bellamy. Improvements in graining and in producing imitative ornamental surfaces, and in certain instruments or apparatus to be employed for such purposes.

2427. Henry Edwin Drayson. An improvement in the manufacture of gunpowder.

2505. William Johnson. Improvements in the manufacture and application of prussiates and other colouring matters. A communication.

2535. William Crosley. Improvements in gas-meters.

2538. William Kemble Hall. The prevention of steam boiler explosions.

2565. Joseph Robinson. Improvements in machinery for drying wheat and other grain.

2581. George Tomlinson Bousfield. Improvements in breech-loading fire-arms. A communication.

2595. Robert Walter Swinburne. Improvements in furnaces used in the manufacture of glass.

2618. David Simpson Price and Edward Chambers Nicholson. Improvements in the manufacture of cast iron.

2632. George Price. A box, chest, or case for the preservation of parchment deeds and documents from damage by steam, when placed inside an iron safe made fire-proof on the vapourising principle.—"Milner's patent, 1840."

2646. Samuel Cunliffe Lister and James Warburton. Improvements in spinning.

2658. Enoch Harrison and Hilton Greaves. Improvements in the manufacture of woven fabrics.

2662. George Edward Dering. Improvements in galvanic batteries.

2718. Westley Richards and Joseph Rock Cooper. An improvement or improvements in breech-loading fire-arms.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

1034. John Thomas Way and John Manwaring Paine.
1042. Jules Lejeune.
1052. William Irlam.
1065. John Mason.
1071. Thomas Dunn, Hugh Greaves, and William Watts, junior.
1073. André Cointry.
1077. Richard Blades.
1079. Sir Francis Charles Knowles.
1089. Frederick Joseph Bramwell.
1090. Archibald Slate.
1098. George Thomson.
1119. Jean Baptiste Moinier and Charles Constant Boutigny.
1120. Jean Baptiste Moinier and Charles Constant Boutigny.
1127. John Roydes.
1128. Ephraim Mosely.

1853.

14. Charles Edward Amos.

LIST OF SEALED PATENTS

Sealed December 7, 1855.

1437. Auguste Edouard Loradoux Bellford.
1439. Herbert Newton Penrice.
1446. Auguste Edouard Loradoux Bellford.
1448. John Young.
1454. Auguste Edouard Loradoux Bellford.
1456. Frederick Leiss and Charles Schneider.
1465. Henry John Distin.
1476. Carl Christian Engström.
1528. Alexander White.
1577. Robert Yeates.
1587. Francis Burke.
1630. Edward Augustus Ferryman.
1796. Robert Barlow Cooley.
2011. John Hamilton Glassford.
2064. John Guy Proger.
2109. Alfred Vincent Newton.
2200. François Fortuné Benvenuti.
2264. William Edward Newton.
2271. Jane Ann Herbert.

Sealed December 11, 1855.

1328. John David Kind.
1340 William Beckett Johnson.
1350. William Moxon and John Clayton.
1352. Joseph Betteley.
1359. Joseph Enouy.
1364. William Hewitt.
1367. Henry Bridgewater.
1372. Dumont Pallier.
1373. William Jones.
1428. Luther Young.
1458. Moses Poole.
1602. Richard Tidmarsh.

1519. William Richard Morris, William Morris, Richard Chrimes, and George Eskholme.
1811. William Henry Lancaster and James Smith.
2030. Henry Hart.
2046. Charles Hewett.
2058. Joseph Camp Griffith Kennedy.
2254. James Murdoch.

Sealed December 14, 1855.

1365. William Clay.
1369. Hippolyte Mathis.

Sealed December 18, 1855.

1380. Richard Peaker and Thomas Bentley.
1382. Henry Bessemer.
1384. Henry Bessemer.
1386. Henry Bessemer.
1388. Henry Bessemer.
1390. Henry Bessemer.
1399. Daniel Gover.
1400. James Letchford.
1405. William Cartwright Holmes.
1412. Robert Watson Savage.
1413. Uriah Lane.
1414. Elise Cochaud.
1417. Jean François Victor Fabien.
1424. Theodore Bougereau.
1432. Oliver Rice Chase.
1470. Louis Joseph Frédéric Margueritte.
1480. Auguste Edouard Loradoux Bellford.
1496. Francis Lycett.
1650. Alfred Tooth.
1970. James White.
1998. William Henry James.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

C.—Your two last communications shall be shortly attended to.

Mathematicus.—The letters by Mr. Merrifield and "Cantab," in this number, render the publication of yours unnecessary.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1690.] SATURDAY, DECEMBER 29, 1855. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

DUVOIR'S PATENT STEAM ENGINES.

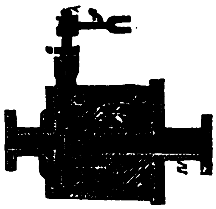


Fig. 3.

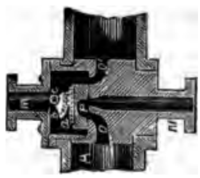


Fig. 4.

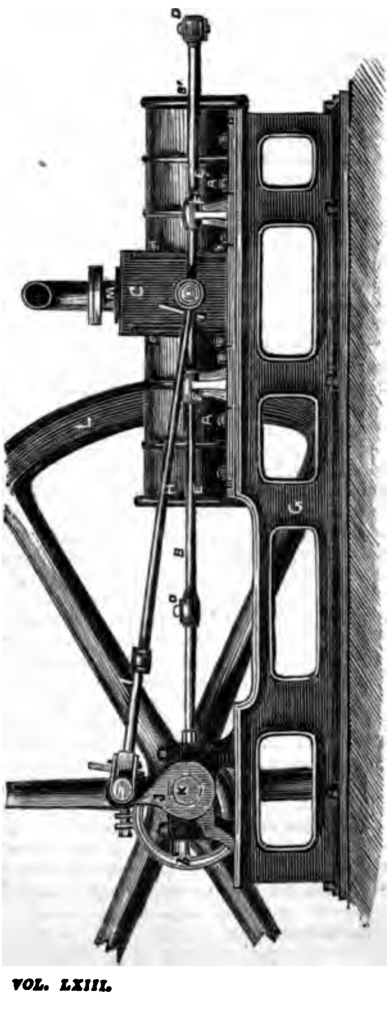


Fig. 1.

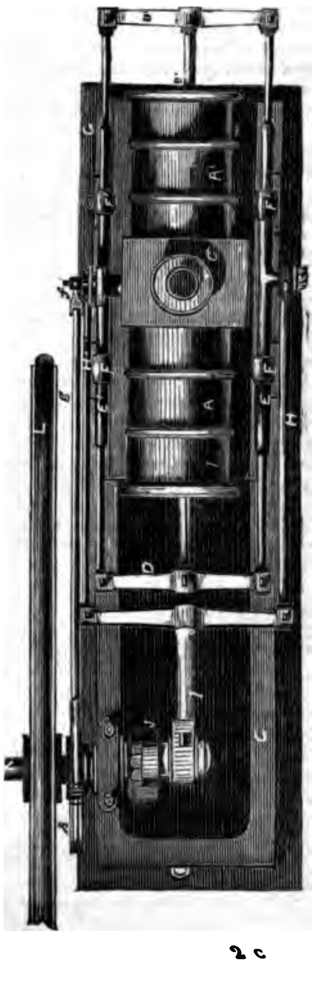


Fig. 2.

DUVOIR'S PATENT STEAM ENGINES.

(Patent dated March 17, 1853.)

M. Narcisse Duvoir, of Liancourt, France, mechanical engineer, has patented an invention which consists of "a peculiar construction and arrangement of the cylinders and valves of steam engines, and the working parts connected therewith, whether high-pressure or condensing, whereby the construction is greatly simplified and rendered less expensive, inasmuch as stuffing-boxes of all kinds are entirely abolished, whilst at the same time a greater effect is obtained from the steam, as the waste thereof is obviated to a great extent."*

According to one modification the cylinders are placed horizontally (though they may also be placed in a vertical or oblique position). Each cylinder is fitted with a separate and distinct piston and rod, and both are single acting, inasmuch as the steam is merely admitted on one side of the pistons, the opposite side being entirely open to the atmosphere, thereby dispensing with stuffing-boxes. The cross-heads of each piston rod are united by side rods, and to these side rods are attached two connecting rods, which are also united by a cross-head, to which is screwed the crank rod. The steam passages or ports in the sides of the cylinders are dispensed with, the valve chest being placed between the contiguous ends of the cylinders, and the steam admitted into the inner end of each cylinder alternately by a slide valve worked by a rack and segment, or other suitable arrangement. The spindle carrying the segment is not passed quite through the valve chest on one side, so that no stuffing will be required there; and on the other side, where it enters the steam chest, it is fitted with a conical collar or shoulder, which works in a conical aperture in the steam chest, and may thus be tightened up to any required extent to prevent escape of steam. "A greater effective power is obtained," says the patentee, "by reason of the absence of the piston rod in that part of the cylinder where the steam is admitted, so that no reduction will be required for the area of the piston rod in the down stroke, both strokes being equally effective. By avoiding steam ports and long steam passages cast on the cylinders, they may be made much cheaper than hitherto, and when in action the loss of steam by condensation in the steam passages will be obviated."

Fig. 1 of the engravings on the preceding page represents a side elevation of the engine in working order; fig 2 is a plan of the same; and figs. 3 and 4 are sectional details of the slide valve and steam chest. It will be seen that the improvements are applied to a horizontal engine, and the axes of the cylinders are both situated in the same line. The two cylinders, A, A', of the same length and diameter, are bored internally to receive the pistons which are fitted to the separate horizontal piston rods, B, B'. These two cylinders have no lateral openings or passages, but each opens at its lower or inner end into the steam chest, C, as shown in detail at figs. 3 and 4, where it will be seen that the bottom of the cylinders is formed by opposite sides of the steam chest. By means of a slide valve shown at P, the steam is, according to one modification, introduced and allowed to escape from the cylinders alternately. The piston rods, B, B', are fixed at their extremities to the cross-heads, D, D', which in their turn are connected with each other by means of the side rods, E, E', thus forming a rectangular frame, the motion of which is precisely similar to that of the pistons. This frame moves always in a horizontal plane, the two side connecting rods being kept in that position by means of the guides, F, F', placed on each side of the cylinders, and bolted to the main framing, G, which is cast in one piece in order to give greater solidity to the machine. To the centre of the side rods, E, E', is jointed the forked connecting rod, H, H', which is connected at its other end with the crank, J. This crank is fixed as in the ordinary engines on the main shaft, K, carrying the fly-wheel, L, and the pulleys or gearing by which the power of the engine may be transmitted in driving machinery. The upper or outer end of each cylinder is not provided with either a covering or stuffing-box of any kind. The two pistons work independently of each other; but through the intervention of the rectangular frame formed by the side rods, E, E', and cross-heads, D, D', the motion produced is precisely similar to that of an ordinary double-action engine. This arrangement "gives out," says the patentee, "the same power at each stroke, no space being taken up by the piston rod, as is the case in the down stroke of an ordinary engine." The steam chest, C, has cast on its upper side the branch, M, to which is bolted the steam pipe for supplying the steam from the boiler to the engine. A branch, N, is also cast on the under side, to which branch is connected the exhaust pipe. O, O' are the two passages or steam ports leading, one into the cylinder, A, and the other into the cylinder, A'. The valve, P, when properly adjusted, allows the steam to enter first into one cylinder and then into the other, thus forcing one piston from the right to the left,

* Patentee's Specification.

and the other from the left to the right. The valve, P, is fitted with a rack, *a*, which is in gear with the toothed segment, *b*, fixed to the wrought iron horizontal spindle, *c*. This spindle is only passed through the body of the steam chest on one side, whilst the other end of the spindle works in a recess in the side of the steam chest, and therefore does not require a stuffing-box at that part. That part of the spindle which passes through the steam chest is enlarged slightly, and is formed into a conical shoulder or collar, and this collar is kept pressed into the conical recess made to receive it by the flange, *e*, which is tightened up by bolts in the same manner as the gland of an ordinary stuffing-box, so that notwithstanding the motion imparted to the spindle when the engine is in action, no steam can escape from this joint, although no stuffing-boxes are used. On the end of the valve spindle, *c*, is keyed a forked lever, *f*, to which the required movement is imparted by means of the eccentric rod, *g*, and eccentric, *h*, on the shaft, K. This engine may obviously be worked either as a high pressure or as a condensing engine. The steam on leaving the cylinder, N, would in the latter case be conveyed to the condensers, which would be of any of the well-known existing arrangements.

THE PROJECTILE CONTROVERSY.

In accordance with our promise to give to our readers a summary of the controversy which, for several successive weeks, obtained currency in our pages, we proceed to review briefly the arguments and positions of the several parties to it. We do not, of course, pretend to enter minutely into the many and various questions which were touched upon by the several writers—this would be an unnecessary and an unprofitable task. Our main object in taking this review in hand, is to lay before our readers the true nature of the objections urged against the fundamental laws of mechanics as at present received, and thus to enable them to judge for themselves as to the degree of credit to which they are justly entitled. We might perhaps have considered this an unnecessary task, but for the evident prevalence, amongst a considerable number of practical men, of a spirit of rebellion against the established code of mechanical laws.

Nothing is so injurious as uncertainty upon these points—we do not say to the cause of truth, for we do not think that to have been at all in jeopardy—but to the class of minds who entertain the objections to which we allude, whether well or ill-founded: and we fear that that class, from some cause or causes into which we do not care to inquire, is at present by no means small. There is unfortunately in this country, if not a rivalry, at least a want of proper understanding between men of science and men of practice. The latter are apparently unwilling to acknowledge any obligations to the former; and the acknowledged imperfections of some theories—caused by ignorance of facts, and inability to cope with the inherent difficulties of arriving at the proper physical data, and not, we believe, by want of skill on the part of our philosophers, or by any uncertainty in the foundations of their science—have been triumphantly produced by many of the practical school as proofs of an utter antagonism between theory and fact, which they, of course, represent as fatal to the former. It is to lay the case, as regards theory, so far as the questions involved in this controversy are concerned, fairly before our readers, that we now take up the pen. They will doubtless recollect that the controversy in question began some five months ago, by the quotation in a letter with the signature, "Civil Engineer," of an extract from a work by Mr. Evan Hopkins, in which that gentleman held up to ridicule and reprobation a passage from Sir John Herschel's "Astronomy," in which the nature of the elliptic motion of the planets round the sun was illustrated by the motion of a body projected at the earth's surface, the effect of the resistance of the air being tacitly passed over. At the same time, a new theory or explanation by Mr. Hopkins, of the motion of a projectile, on the supposition of a continually decreasing, and ultimately evanescent, *projectile force* acting continuously on the body during its motion in conjunction with gravity, was propounded. This theory, it was asserted, would completely reconcile the discrepancies between the observed and calculated motions of a projected body, and would, of course, be of enormous advantage to the science and practice of gunnery. A correspondent, under the signature of "A Mechanic," was the first to enter the lists against this new theory, which was defended by "Civil Engineer," Mr. Hopkins, and Mr. Mushet. "Mechanic" was followed by Mr. Wilkinson, and more lately by "W.," to whom the defence of the received doctrines was tacitly conceded by the former champions. In the course of the controversy, certain observations made by Mr. Hopkins on the sun's apparent diameter in tropical

climates were brought upon the arena, which, as Messrs. Hopkins and Mushet maintained, proved the incorrectness of the fact supposed to be established by observations made by astronomers, that the sun's apparent diameter varies at different times of the year, and that consequently his distance from the earth varies in like manner, and that his motion in the ecliptic is variable also; both of these supposed observations being attributed to the refraction of the atmospheric lens. As the debate waxed warmer, the received laws of motion were called in question; and many promises were made, especially by Mr. Mushet, of *proving* that the first law is at variance with physical truth; but we must here state, that that gentleman produced no such proof, but challenged his opponents to produce *proofs* of the first law, for which they naturally remanded him to elementary works. This we believe to be a fair outline of the course of the controversy, upon which we now proceed to record our sentence.

Now with regard to the quotation from Herschel's "Astronomy," we consider the objections raised by Mr. Hopkins and his *collaborateurs* sufficiently disposed of by the consideration, that Sir John Herschel had in the passage in question no reference whatever to the science of gunnery; and that his mere object was to illustrate by the parabolic path which a body would describe when thrown up at the earth's surface but for the resistance of the atmosphere, the elliptic re-entering paths which bodies in space would describe under the action of solar attraction alone. Our esteemed correspondent, Mr. Wilkinson, very fairly put the case on this ground, from which no subsequent efforts of the objectors succeeded in removing it.

As regards Mr. Hopkins's new theory of projectile motion, we think "W." fully succeeded in showing that the term *projectile force*, as supposed to act on the body during its whole time of flight, is inapplicable. The effect of the force applied in the projection of the body, whether by the hand, by gunpowder, or any other cause, was rightly stated to be the generation of a *certain velocity* in the projectile body in a certain direction; but no *force* arising from this cause acts on the body after it has left the region of its *direct application*. The problem to be discussed, therefore, is, as rightly stated in sound mechanical works, this: A body being projected with a given velocity, and in a given direction, under the action of the force of gravity and of the resistance of the atmosphere, to determine its subsequent motion. The question then *arises*, Is the velocity with which the body is originally projected subject to diminution according to any law *independently* of the action of the external forces? Apparently Mr. Hopkins, and certainly Mr. Mushet, answer this question in the affirmative, and thereby join issue with the philosophical world, which has, ever since the days of Galileo, maintained that *all change of motion, or tendency to change of motion* in the case of a body already moving is due entirely to the action of some *external* force; in other words, denying the existence of what was formerly called the "vis inertiæ," or force of inertia, supposed to reside in every body, and which tended to check the motion with which it is endued. Before we proceed to discuss this, which is the main question in the controversy, we may dispose of Mr. Hopkins's new theory. He treats the question as if the supposed diminishing and ultimately evanescing projectile force, and the force of gravity, had alone to be considered in the case of a body projected at the earth's surface, thereby committing the very error of which he so loudly complains when Sir J. Herschel is the culprit; viz., omitting all cognizance of the resistance of the air.

Again; all that he can be supposed to have shown—if he has shown anything—is that a body might describe a path something similar to that of a projected body, if the velocity were supposed constantly to diminish and ultimately to vanish while gravity acted upon it. No one disputes that on such a supposition the path would certainly not be a parabola, and that its form would be *something like* the real form of the orbit, so far as that the *horizontal projection* of the path from the point of projection to the highest point would be longer than from the last-named point to that at which it arrives at the earth again. But to make out his point, a mere *general illustration* (in which form alone his theory has at present been presented to us), is quite insufficient. He ought to have ascertained the *exact law* according to which the velocity diminishes; and by a succession of experiments, in which the actual path of a body projected in many different directions, and with various amounts of velocity, had been carefully measured, he should have shown that the observed path, and the path calculated on his hypothesis, did accurately agree. No such thing has been attempted, and we may therefore fairly omit for the future all reference to this theory, having, as it has, no evidence in its favour.

Now as regards the laws of motion, it may perhaps be as well to state them for the benefit of those of our readers who may not be very familiar with the science of mechanics.

1st Law.—A body in motion, and not

acted on by any *external* force, will continue to move uniformly, without change of direction; that is, will go on moving in a straight line, and describing equal spaces in equal times.

2nd Law.—When a force acts on a body in motion, the change of motion produced by it is in the direction and proportional to the magnitude of the force so acting.

The third law is variously stated. According to Newton, and some who have adopted his words, it is this: Action and reaction are equal and opposite. According to others, its statement is this: "When pressure communicates motion to a body, the moving force is as the pressure;" in other words, the effects of forces, whether actually producing equilibrium or motion—that is, whether measured (as in the one case) by the number of pounds weight which they would sustain, if applied in a direction opposite to that of gravity, or by the product of the mass of the body to which they are applied, and of the velocity generated in a second of time, are always proportional to one another. So that if P and P_1 be the number of pounds of weight which two forces would directly sustain, M and M_1 the masses of two bodies to which they are respectively applied, V and V_1 the velocities in a second of time which they generate in those bodies; then

$$P : P_1 :: MV : M_1V_1.$$

French mechanical writers have never adopted any but the two first laws; and we really believe that English writers have thought it advisable to adopt the third more out of a deferential regard to the authority of the immortal Newton, than from the necessity of the case. We would rather incline to regard the *third law* stated in either of the ways above mentioned as a *mechanical principle* (as was intimated by "W.") than as a law of motion strictly so called. It is the *first* law only, the authenticity of which has been impugned. What is the evidence we have for this law?

As regards direct experiments in proof of it, we are met with this great difficulty, that we can, by no contrivance, experiment on a body strictly under the conditions supposed in the first law. The *resistance* of the air, and friction of various kinds acting on all bodies at the earth's surface, immediately produce an effect in retarding their motion, and ultimately reduce them to rest. All that we can do in the way of experiment, then, is to reduce to the lowest amount possible these retarding forces, and to observe the effect of such reduction on the body's motion. Accordingly we find that a stone projected along smooth ice (the friction of which is comparatively small) will travel much farther than a stone similarly projected along a level road (the friction of which is considerable). So, again, when by means of friction or anti-friction wheels, or other contrivances, the retardation arising from this cause has been reduced; and when, by exhausting the air from the receiver of an air-pump as far as it is capable of being exhausted, the atmospheric resistance has been reduced, a pendulum set to vibrate under this exhausted receiver is found to continue in motion a *very much longer time* than the same pendulum would in the air; and a body made to fall (by means of Attwood's machine) under the action of gravity, describes much more nearly the space it ought to do in accordance with calculation based on the two first laws, than if the resistance had not been diminished by these means. By these and similar experiments we render the *first law probable;* we see that by reducing the retarding forces, which we know do and must operate, we make the body's motion more and more conform to what it ought to be, in accordance with the first law.

The most satisfactory evidence, however, to the thinker who is capable of following out the requisite investigations is that which arises from the complete accordance of the *observed facts* of motion in a great number of cases, with the facts as calculated in accordance with these laws.

Nature is, of course, our best experimenter; and it is evident that with every fresh case in which nature's experiments are shown to accord with our calculations, the probability of the correctness of the laws on which we proceed rises higher and higher, until at last the probability is of that kind which we denominate *moral certainty*, and of which the inquirer capable of appreciating the evidence entertains no sort of doubt.

Now, this is exactly the kind of evidence on which the existence of our laws of motion is most satisfactory, and we may add irrefragably based. All calculations, with regard to the application of steam-power, and other motive powers of the same class, are based on the strict truth of the received laws of motion. Were there an inherent tendency in all bodies to retard their own motion, these calculations would certainly give results *very far indeed from the truth;* whereas in reality they are found sufficiently correct for all practical purposes. All these cases afford links in our chain of evidence.

Again, when we ascend into the higher regions of space, the evidence is, if possible, even of a higher kind. The *approximate* motions of the heavenly bodies (omitting all the *smaller* forces, which *disturb*, as it

were, the principal motion) are so exactly in accordance with the motions they should have in the supposition of the truth of the laws of motion, that they produce a conviction almost as strong as that produced by demonstration. But when we go a step further, and calculate the actual places of the heavenly bodies, not only approximately, as attracted towards the sun with a force beyond comparison greater than any other force by which they are solicited, but together with all those minute corrections due to their mutual attractions (a calculation, be it observed, requiring the utmost resources of modern analysis), and when we find the observed and calculated places of these bodies agree so admirably as they do, how is our conviction of the reliable nature of every step of our process, of every principle on which it is based, enhanced! When in addition to all these small residuary differences in the position of one of these bodies—Uranus—after all the sources of disturbance have been carefully investigated, are found to exist and to remain unaccounted for, two mathematicians, in different countries, having no kind of communication with one another on the subject, both arrive, by the solution of a most difficult problem, at the same result almost simultaneously (our own countryman, Mr. Adams, having by a few months the precedence in discovery over M. Leverrier, although, unfortunately, through the neglect, may we not say culpable neglect of some of our great philosophical notables, not the precedence in publication) predict the discovery of a new planet at a certain place in the heavens, at a certain time, at which time and within a degree or two of which place, the planet is accordingly discovered, how can we withhold for a moment our full and free recognition of the principles on which their prediction was made? These principles are based on the two laws of motion; and it is not too much to say that were those laws incorrect, the new planet *could* not have been so discovered.

Now, strictly, such as we have described is the nature of this evidence in favour of the first law of motion; evidence which we may well say has not been exceeded in strength and variety, in support of any law not strictly capable of demonstration. This is, we conceive, the purport of most that has been written on this controversy, by our very able correspondent, "W.," with whose arguments we take this opportunity of expressing our general concurrence. All, as far as we can understand, that has been [s]aid, and can be said, against the received law is, that no *direct experiment* fully proving it has hitherto been submitted to the public. This demonstrative proof, for reasons we have already explained, is impossible; for it is acknowledged that we *cannot*, at the earth's surface, under any possible circumstances, break away from the operation of all descriptions of external force. When, therefore, it is triumphantly asserted that we know of no instance within the immediate sphere of our observation where uniform motion can be maintained without the constant application of a force, and it is hence inferred that all motion requires a constant application of force to maintain it; we answer—and the answer is sufficient and irrefragable—that the external force is required *because* a retarding force is, from the nature of the case, always acting; and that when uniform motion results, the retarding and *accelerating* forces (accelerating, in the sense of *adding* to the body's velocity) are strictly in equilibrium. On the whole, then, we conclude that the very little in the way of argument that has been put forth *against* the laws of motion, and the great deal that has been advanced in *support* of them, are sufficient to convince the most sceptical that nothing has hitherto been produced that can come into competition with these laws, while those who are endowed with an ordinary amount of faith will accept them as true without further hesitation.

As regards Mr. Hopkins's supposed discoveries in the laws of refraction, we can only say that at present they rest upon the observations of one man alone; while observations agreeing with those made at Greenwich, Paris, Berlin, and other standard observatories, have been made by men of known scientific attainments and known accuracy, in the very regions which have been Mr. Hopkins's chosen field. The most liberal concession, therefore, which Mr. Hopkins can expect us to make in their favour is, that we are ready to suspend our judgment on their accuracy, until they have received confirmation from other and independent quarters.

The very loose style, both of argument and language, which Mr. Hopkins permits himself to use in the elucidation of his notions, is not, perhaps, very well calculated to ensure for them a very respectful reception; and we must confess, on our own part, the same inability sometimes to understand what Mr. Hopkins means as has been felt by some of our correspondents.

But whether correct or incorrect, this we know, that they cannot bear out all the inferences which Mr. Hopkins draws from them. If the sun's apparent diameter were really the same when freed from atmospheric illusions all the year round, then un-

doubtedly the inference that the sun is always at the same distance from the earth is sound. But the unequal motion in longitude of the sun at different periods of the year cannot be so explained; and the fact, that the sun is seven days longer in performing the half of his orbit between the vernal and autumnal equinoxes, than the other half, must still force the conviction, that even should his orbit be circular, his motion in that orbit is not uniform.

We have regretted to observe, that in this controversy arguments and facts have been too frequently met with hard words and stout denial. One party also has resorted to the artifice of endeavouring to strengthen their cause by imputing interested and corrupt motives to the general body of mathematicians. Their own arguments, it has been tacitly assumed, are unanswerable; but mathematicians reject them because they are pecuniarily interested in maintaining the present erroneous system. If these gentlemen had succeded in given even a probable air to their new notions, we might have thought an inquiry into this imputation worth instituting; but under actual circumstances, it is too baseless to require the expenditure of one moment in its refutation.

One gentleman, Mr. Mushet, has written largely, and we will add, with much ability of a certain kind, on the side of Mr. Hopkins. But from his voluminous letters, we must say we have been able to extract but little to the point. There are undoubtedly minds, to which a smart style, abounding with happy antitheses and flowing with rounded period, although at the same time deficient in real point, is more convincing than the most close and pressing argument. To such minds, Mr. Mushet's letters on this subject have no doubt proved highly satisfactory. For our part we do not, however, very highly value such excellencies when they form the staple of a *philosophical* controversy. This we must offer as our apology for making so few references to that gentleman who has written most voluminously in the dispute we have now reviewed.

We have now accomplished the task which we proposed to ourselves, and we trust that the few words we have thought it necessary to say by way of summary of the arguments used in the "projectile controversy" will assist our readers in forming their judgment on the case. We conclude by reiterating our former notice—that we consider this controversy finally closed, and that we cannot admit any more letters on the subject.

MECHANICAL NOTATION:

EXEMPLIFIED ON THE SWEDISH CALCULATING MACHINE OF MESSRS. SCHEUTZ.*

BY HENRY P. BABBAGE.

THE system of describing machinery of which I am about to give a brief outline, is not new. It was published by Mr. Babbage in the "Philosophical Transactions" in the year 1826, where apparently it did not attract the notice of those most likely to find it practically useful. It had been used for some years before this in the construction for the government of the Difference Engine, which is now in the museum at King's College, London, and it was also used in the contrivance of the Analytical Engine, on which my father was engaged for many years. Indeed, without the aid of the mechanical notation it would be beyond the power of the human mind to master and retain the details of the complicated machinery which such an engine necessarily requires. Its importance as a tool for the invention of machinery for any purpose is very great; since we can demonstrate the practicability of any contrivance, and the certainty of all its parts working in unison before a single part of it is actually made. It is also important, both as a means of understanding and of explaining to others the mechanism of existing machinery: for it is utterly impossible to make the notation of a machine without comprehending its action in every single part. There are also many other uses, which I shall not now stop to mention. The general principles of the notation are the same now as in 1826, but the practical experience of many years has, of course, suggested several alterations of detail and led to the adoption of some important principles.

To understand the construction of a machine, we must know:—the size and form of all its parts—the time of action of each part—and the action of one part on another throughout the machine. The drawings give the size and form, but they give the action of the parts on each other very imperfectly, and scarcely anything of the time of action. The notation supplies these deficiencies, and gives at a glance the required information. When the drawings of a machine are made, it becomes necessary to assign letters to the different parts. Hitherto, I believe, this has been left much to chance, and each draughtsman has taken the letters of the alphabet, and used them with little or no system. With respect to lettering, the first rules are that all *framework* shall be represented by *upright* letters. *Moveable pieces* shall be represented by *slanting* letters.

* British Association, 1855.

Each piece has one or more working points —each of the *working points* must have its own *small* letter—the working points of *framework* having *small printed* letters, and the working points of the *moveable pieces* having *small written* letters.

Thus we have machinery divided into framing, indicated by large upright letters; as A, B, C, &c. Moveable pieces indicated by large slanting letters, as *A*, *B*, *C*, &c. Working points of framing indicated by small printed letters, as a, c, e, m, n, &c. Working points of moveable pieces indicated by small written letters, as *a*, *c*, *e*, *m*, *n*, &c.

In lettering drawings the axes are to be lettered first. Three alphabets may be used the Roman, Etruscan, and Written, as—

A, B, C, &c.

A, B, C, &c.

𝒜, ℬ, 𝒞, &c.

These should be selected as much as possible, so that no two axes which have arms or parts crossing each other shall have letters of the same alphabet. Having lettered the axes, all the parts on them, whether loose or absolutely fixed to them, must be lettered with the same alphabet, care being taken that on each exis the parts most remote from the eye shall have letters earlier in the alphabet than those parts which are nearer. It is not necessary that the letters should follow each other continuously as in the alphabet; for instance, *D*, *L*, *T*, may represent three wheels on the same axis, *D* must be the most remote, *L* the next, and *T* the nearest. The rule is, that on any axis, a part which is more remote from the eye than another, must invariably have a letter which occurs earlier in the alphabet. By these rules very considerable information is conveyed by the lettering on a drawing; but still more to distinguish parts and pieces, an index on the left hand upper corner, is given to each large letter; this is called the "index of identity," and all parts which are absolutely fixed to each other must have the same index of identity; no two parts which touch or interfere with or cross each other on the drawings must have the same index of identity. This may generally be done without taking higher numbers than 9. All pieces which are loose round an axis must have a letter of the same character, Roman, Etruscan, or Writing, but a different index of identity will at once inform us that it is a separate piece, and not fixed on the axis. For example, ${}^6D$, ${}^6L$, ${}^6T$, would indicate that the three wheels mentioned above were all *fixed* to the same axis; but ${}^6D$, ${}^8L$, ${}^6T$, would at once show that *D* and *T* were fixed to the axis, and *L loose* upon it.

I shall now endeavour to explain how the transmission of motion and action of one piece on another is shown. Beginning from the source of motion, each part is written down with its working points; those of its points which are acted on are placed on the left-hand side; those points where it acts on other pieces are placed on the right hand; if there are several small letters, a bracket connects them with their own large letter.

$$\left.\begin{matrix} n \\ s \\ o \end{matrix}\right\} P \left\{\begin{matrix} u \\ a \\ e \end{matrix}\right.$$

The pieces being arranged, arrow-headed lines join each acting or driving point of one piece with the point of another piece, which it drives or acts on. When a machine is complicated it is usually necessary to make two or three editions before all the parts can be arranged with simplicity; but when done, the trains, as they are called, indicate with the utmost precision the transmission of force or motion through the whole machine, from the first motive power to the final result. It is, however, one of the principles of the notation to give at one view the greatest possible amount of information, provided that no confusion is made: it has been found that, without in any way interfering with the simplicity of the trains, a variety of information on other points may be conveyed. For instance, whilst looking at the trains, it is often convenient or necessary to know something of the direction of motion of the piece under consideration, and, by the use of a few signs placed under the large letters, we can convey nearly all that is wanted in this respect. Again, though the drawings of a machine are specially intended to give the size and shape of each piece, yet, by the use of some signs of form which are placed above the letters, the form of each piece may be indicated. It is found that these signs do not confuse the trains, but, on the contrary, extend their use by making the information they convey more condensed, and more easily accessible.

I now pass on to the cycles, as they are termed, or to that part of the notation which relates to the time of action of the different parts of a machine. The cycles give the action of every part during the performance of one complete operation of the machine, whatever that may be. Each piece has a column of its own, and the points by which it is acted on are placed on its left hand, and the points by which it acts on other parts are placed on its right; and each working point also has its own column. The whole length of the column indicates the time occupied in performing one operation, and we divide that time into divisions most suited to the particular machine. During each division of time that a piece

is in motion, an arrow up or down its column indicates the fact; and during the time of action of each working point, an arrow in its own column shows the duration of its action. The times thus shown are, of course, only relative and not absolute time; but it would be easy to show both, by making the divisions of the columns correspond with the number of seconds or minutes during which the machine performs one operation. The arrows which point upwards indicate circular motion in the direction screw in, and the arrows which point downwards screw out; where the motion is linear, the downward arrow indicates motion from right to left.

Mr. H. P. Babbage then illustrated this system of notation by directing attention to the notation of the Difference Engine of Messrs. Scheütz. This machine contains several hundred different pieces, yet the trains showed, at one view, how each piece was acted on, and how it acted on other pieces. The cycles gave with equal clearness the time of action of each piece. In fact, the two pieces of paper before the section, gave a complete description of the machine, and with the drawings rendered further description unnecessary.

The cordial and unanimous thanks of the section were given to Mr. H. P. Babbage for this paper.

ON THE APPLICATION OF VOLUTE SPRINGS TO SAFETY VALVES.

A paper on the above subject, by Mr. J. Baillie, was read at the Institution of Civil Engineers, on the evening of November 27th, having been communicated by Mr. R. Stephenson, M.P., V.P.

The volute spring, stated to have been invented by Mr. Baillie, the locomotive superintendent of the Central Hungarian Railway, was described to consist of "a single plate of steel, wound spirally in a conical shape, sustaining pressure and deflection in reference to its breadth instead of thickness, and was constructed of thicker and deeper plates, according to the increased strength desired.

"The effect attained by this form of applying steel to resist pressure was found to be such, that equal loads were sustained by one-third the weight necessary for elliptical springs of like capabilities and power.

"From the peculiar mode in which the rigidity and elasticity of the material was applied in these springs, although so very light, they were not liable to break, or to be injured by any amount of force, if properly fitted; and the experience of upwards of seven years had proved that they were very economical for all railway purposes. The same experience had proved the unfitness of caoutchouc, or other substitutes for steel for mechanical application, where great wear and tear had to be sustained, while the elliptical form of spring had many disadvantages, which were obviated by the direct action, the compactness, and the elasticity of the volute; and the saving effected by their adoption was not only in the first cost, which was great, but also in repairs, owing to the simple construction and application of the volute; whilst, in addition, much of the iron-work necessary in fitting ordinary springs was saved."

It was stated that the volutes had been adapted not only to an immense number of locomotive engines, both abroad and in England, but also to tenders, waggons, trucks, and carriages for bearing, buffer, and traction springs, and in all cases with decided advantage as to space and durability over the ordinary elliptical springs. They were also now beginning to be employed as auxiliary springs for common road-carts and waggons; and they were proved to be very valuable for many kinds of machines liable to sudden pressure, such as any unyielding substance passing between rollers, which would otherwise almost inevitably be fractured.

Concurring in the almost universal opinion of the inadequate dimensions of the safety-valves being the most fruitful cause of explosions, and, at the same time, appreciating the practical difficulties attendant upon increasing the number or the area of the ordinary valves, with the present system of weighting them, Mr. Baillie determined to try whether a safety-valve of large area could not be conveniently and steadily held down by a number of volute springs of known power. This appeared to act extremely well, and in order to test the new system, in comparison with the ordinary method, a safety-valve of 12 inches diameter, held down by seven volute springs, was adapted to a locomotive boiler, on which there was also an ordinary valve of 3·6 inches diameter, weighted with the usual lever and spring balance. The boiler possessed an area of heating surface of 890 square feet; but lest the cylinders should take too much steam, the engine remained stationary during the experiments, and the fire was urged by a constant jet of steam of half an inch diameter, into the chimney. The two valves were equally weighted to a pressure of 64 lbs. per square inch. The large valve was then fastened down, and in four minutes the pressure of the steam had increased to 105 lbs. when the small valve had risen 1-12th of an inch, and the experiment was

stopped, as the valve could not discharge the steam so fast as it was generated.

The small valve was then screwed down, and the large valve was set free; in four minutes the pressure had only increased from 64 lbs. to 76 lbs. per square inch, or 12 lbs., when the valve rose 1-24th of an inch; and although the fire was powerfully urged for upwards of half an hour, the pressure of the steam could not be raised beyond 76 lbs., as the large area of the safety-valve allowed all the steam that was generated to escape freely.

These experiments were considered so satisfactory, that the system of using volute springs for the valves had been generally adopted for the boilers of the locomotives of the Hungarian and Austrian railways, upon which Mr. Baillie was engaged.

In order to commence the discussion, a description of an improved form of safety valve for steam boilers, by Mr. J. Fenton, M. Inst. C. E., was read by the secretary.* A considerable number of these valves had been in use for some time with decided success; they afforded a considerably greater security than the ordinary safety valves, without greater expense of construction, and it was anticipated that they would be more durable than the ordinary valves, and be quite as easily repaired and kept in order.

In a recent letter to Mr. Kirtley, it was stated by Mr. Baillie, that eighty-one engines on the Hungarian and Austrian lines were carried upon volute springs, and it was intended to alter all the others as opportunity offered. Double springs had been generally used for the middle bearing, but it was not now considered necessary, as some engines with single springs appeared to be quite as steady, and not to receive greater shocks than the others. The great point to be attended to was, that the volutes should not be overloaded, nor be screwed down too tightly. A volute of steel 5¼ inches broad and $\frac{7}{32}$ inch thick should not be loaded with more than 20 cwts., nor one of 4¼ inches broad and $\frac{7}{32}$ inch thick with more than 15 cwts., and it would be still better if their loads were reduced to 18 cwts. and 13½ cwts. respectively.

Great attention should be paid to the due and proportionate loading of the springs under an engine, and the engine-driver should be strictly prohibited from altering the position of the nuts on the holding bolts of the springs, as, besides injuring the volutes, an undue weight must be thrown upon the other axles, and damage would ensue to the machine as well as to the rails.

With the ordinary flat springs, it was difficult to ascertain exactly what pressure was put upon them by altering the screws; but with the volutes a certain law obtained, which rendered evident the absolute pressure to which they were subjected. Each spring was depressed a certain distance by a given weight, say, for instance, those of certain dimensions would be depressed ¼ inch by 6 cwt.; so that if the spring was originally 8¼ inches high, when unloaded, it would, under a weight of 18 cwt., have been reduced to 7½ inches in height; then by trying, and marking the trial weights upon the volutes, and regulating them accordingly, there could not be any error in computing the pressure upon them.

The weighbridge for ascertaining the exact weight upon each wheel had been generally adopted with good effect, and to prevent the engine-men from altering the weight upon the springs, some thin washers were placed between the cross-bar and the collar upon each holding bolt, which precluded the possibility of tampering with it. The effect of this regulation had been, that the engine springs rarely required to be meddled with, and very few fractures occurred, unless the railway was in a bad state.

The reason for employing such heavy engines for the conveyance of passengers was, that there was only one train of that kind per day, and one mixed train of passengers and goods at night; the former weighing about 160 to 180 tons, and running at a speed of 30 miles an hour, and the mixed train weighing from 250 to 270 tons, travelling 24 miles per hour. The bulk of the traffic consisted of goods, of which from 60,000 to 70,000 tons were conveyed per month along the railway from Szegedin and Szolnok to Vienna, a distance of 304 English miles, which length it was intended to extend to Weiskirchen, about 140 miles further to the south-east of Szegedin.

An illustration was given of the adaptation of the volute springs to hydraulic safety valves for equalizing the pressure on water-mains, and obviating the injurious effects of the concussion caused by the oscillation of the column of water. This system, which had been introduced by Mr. Croker, for the Amsterdam Water-works, was easily adjusted to a head of 170 feet, representing a pressure of 39·2 lbs. per square inch, or a total load of 1,970 lbs. on the valve; it had been in use for six months, and might be perfectly relied upon.

The arrangement was very simple, consisting merely of a vertical branch of 8 inches diameter springing from the horizontal main pipe of 6 inches diameter; on the top of the branch pipe was fixed a valve

* This valve has been fully described in our pages. See *Mech. Mag.*, vol. lxi, p. 529, No. 1634, and vol. lxii., p. 396, No. 1655.

and seat of gun metal, so arranged that upon the lugs were fixed the wrought iron bolts holding the cross-bar, between the under side of which and the top of the valve was placed a volute spring of about 2½ tons pressure; the exact pressure was regulated by adjusting bolts provided with stop-nuts, and the apparatus could be accommodated to the required head with great facility and precision.

THE "WIEN RAAB" LOCOMOTIVE ENGINE.

DRAWINGS of the above engine, which was constructed by Mr. John Haswell, Locomotive superintendent of the Vienna and Raab Railway, and sent to the Exhibition of Industry at Paris, in the present year, were exhibited at the last meeting (on November 27) of the Institution of Civil Engineers. The chief characteristics of this engine, which was intended principally for the goods traffic, were its having outside cylinders, inside framing, and eight wheels, all coupled. As the distance between the axles of the leading and the trailing wheels was 12 feet, it was necessary to have special arrangements for enabling this great length to pass curves of short radius; this was accomplished by allowing the bearings of the trailing axle and its coupling rods to have a lateral motion of 18 lines, and in the trials upon the Sömmering Inclines, of 1 in 40, it was found that this engine would draw up a load of about 110 tons, at an average speed of nearly 12 miles per hour, passing with facility round curves of as small a radius as 600 feet; the motion of the engine being much steadier than that of any others of the same power. When evaporating 200 cubic feet of water per hour, the engine could draw, on a level, a load of 1,047 tons, at a speed of about 14¼ miles per hour.

The engine, with the water in the boiler, weighed 34 tons, and the division was so arranged that no wheel pressed with more than 4·4 tons weight upon the rails;—a great superiority over other engines tried upon the line, as in some cases the weight was as much as 7 tons upon one wheel, which would suffice to destroy the heaviest rails; and the ultimate effect was, that when the permanent way became uneven, the jerks were so severe that the springs could not prevent them being seriously felt by the engine, the structure of which was soon dislocated.

The fire-box was arranged for burning wood, or turf, but with a trifling modification could be adapted for coal, or coke, and the spark catcher was like that of the American engines.

All the chief working parts were so placed as to be fully in sight, and were easily accessible for examination, for oiling, and for repair.

The guides for preventing the lateral oscillation of the wheels and axles were placed in the centre between the axle-boxes; and between the side-plates was a guide-block, working upon a pin, on the same level as the axle traversing the guides. By this arrangement it became possible for one wheel to rise, or fall, without the frame of the engine being strained.

The volute springs, which were used for bearing the weight of the engine, were placed withinside the frame, and in consequence of the arrangements already described, could be fixed considerably lower than the ordinary flat springs; thus obtaining the great advantage of lowering the centre of gravity.

The wheels were cast-iron discs, with cast-steel tyres.

The boiler was of the ordinary construction, and had adapted to it a safety-valve with a large aperture, held down by the volute springs, by which any accumulation or pressure of steam beyond 8-10ths of an atmosphere, above the maximum working pressure, was effectually prevented. In practice this had been found to offer an effectual protection against accidents arising from carelessness or daring, and the system was now adopted for all the engines on the railway.

PATENTS FOR WOOL-COMBING MACHINERY.

COURT OF QUEEN'S BENCH, SATURDAY, DECEMBER 22, 1855.

Sittings at Nisi Prius, at Guildhall, before Lord CAMPBELL *and a Special Jury.*

LISTER AND ANOTHER *v.* LEATHER.

This was an action for the alleged infringement of a patent for a wool-combing machine.

The defendant pleaded several pleas, the principal of which was, that the invention claimed by the plaintiffs was not new, and that he therefore had not, as alleged, infringed upon the plaintiff's patent.

Sir F. Thesiger, Q.C., Mr. Montagu Smith, Q.C., Mr. Webster, and Mr. Chance, appeared as counsel for the plaintiff; the Attorney General, Mr. Grove, Q.C., and Mr. Hindmarsh, conducted the case for the defendant.

The case occupied the court during the whole of Friday and Saturday.

The evidence of the numerous witnesses having been brought to a close, Sir F. Thesiger replied.

Lord Campbell summed up, and submitted several questions to the jury, relating to patents for wool-combing, taken out by other parties in past years, and requested them to return their verdict in written answers.

The jury retired at a quarter past seven o'clock, and at a quarter to eight returned into court, and gave answers to the various questions, the result being substantially a verdict for the defendant.

It is gratifying to know, that by this finding of the jury, the exorbitant claim of Mr. Lister to the exclusive use of all wool-combing machinery is completely annulled. By it the whole of his foreign patents are also rendered void.

ECONOMIC MUSEUM.

A collection of articles, models, drawings, and publications, tending to promote health, comfort, and economy among the industrial classes, or to illustrate their present condition in various parts of the world, is now being formed by the Society of Arts, under the management of Mr. T. Twining, jun., one of the Vice-Presidents of the Society. Contributions and communications, home, colonial, and foreign, should be addressed to "T. Twining, jun., Esq., Society of Arts, Adelphi, London."

Adcock's Engineer's Pocket-Book for the year 1856. London: Simpkin, Marshall, and Co.

In this little work the civil and mechanical engineer, and indeed any one whose profession is connected with mechanical science, will find a large amount of useful information collected, a great number of principles concisely stated, and many eminently useful experimental results compactly and neatly tabulated.

The book contains the ordinary almanac with appendages, a diary and cash accounts, various matters of science useful to the practical man, together with tables exhibiting the strength and properties of materials of construction in common use, the value of different kinds of coal, proportions of steam engines, &c., &c.; and all these very well arranged for purposes of reference. Considerably praise is due to the arrangement and to the choice of the matter collected in the Engineer's Pocket-book.

The great requirement, however, in a compilation of this description, is that it be accurate and trustworthy. If it cannot be depended on for correctness in *everything*, it is almost, if not quite useless, and the engineer had better construct a pocket-book, *suâ manu*, from his own experience. Of course we do not pretend to answer for the value of the many tables before us, as the examination of them in detail is quite out of the question. All that we can say for them is, that they appear to be derived from the best authorities. Most of the tables may be recognized as old acquaintances by those conversant with the labours of Morin, Moseley, Main and Brown, Hodgkinson, and others.

Here we may remark, that the editor of this little book seems very anxious to acknowledge anything which is obtained from Mr. Hodgkinson; his name may be seen several times repeated on a large number of consecutive pages; but Professor Moseley is quoted as an authority not more than twice, we think, although there is no insignificant number of tables, &c., which appear to be copied *verbatim et literatim* from this writer. Perhaps this may be regarded as a piece of *editorial prudence*. Another favourable indication is, that the literary portion of the performance has the air of being by a person who has a tolerable knowledge of his work. But this brings us to a circumstance which engenders some suspicion. It is of the first importance that a work like the one under notice, should be corrected and revised with very great care. We are sorry to say, that it does not appear, from the portions we have been able to examine, to have enjoyed this advantage. This is a pity, because even if the inaccuracies are confined to what may be regarded as unimportant matters, yet they have a tendency to shake the confidence that the editor must wish to gain and keep. We will just point out a blemish or two of this kind which have struck our eye in glancing through the pocket-book. First,—The word "guise" is new to us as used to denote what common people call the *guy* of a crane or a pair of sheers. On pages 34 and 35, we find an inaccuracy of a similar kind, but having a certain air of originality about it, relating to a connection between the *metacentric curve* and the *locus* of the centre of buoyancy. In the theory of stability of floating bodies we read, "The metacentric curve is the evolute of which the curve PP (the above-mentioned locus) is the involute. Hence the reason that Mr. Reed has called the curve PP the metacentric involute, and for the same reason the *metacentric curve* might be called the metacentric evolute." This is by no means so. Mr. *Read* (as it should be,) has named the locus of the centre of buoyancy the metacentric involute, because it is the *involute of the metacentric curve;* so that this curve cannot, from such a reason, be called the metacentric evolute, unless it possess the remarkable property of evolving itself, which property in no way appears to belong to it. We might also take exception to several sentences in the article on "Laws of Motion," in which clearness has been, to some extent, sacrificed to brevity. Although these little matters may not much diminish the utility and value of the work, they ought to be carefully excluded from it.

SUBMARINE TELEGRAPHS.

To the Editor of the Mechanics' Magazine.

Sir,—In a former number, when referring to the destruction and breakages that have occurred to the submarine cables being laid in the Mediterranean and the Gulf of St. Lawrence, 160 and 70 miles respectively, you make mention of the excessive weight, consequently self-destructive and expensive construction of these cables, and refer to one patented by me in February 1853, wherein such mal-effects are avoided. So far so good; but as submarine telegraphy is but in its infancy, and a subject of much interest and importance at the present time, I may be excused for drawing your attention to further improvements in these matters in a subsequent patent of mine which you seem to have overlooked, and which describes not only a novel principle, but opens up an entirely new system of forming and constructing submarine electrical communications not previously desiderated. These plans were first devised principally with the view of overcoming the palpable difficulties to such an enterprise as laying a line across the Atlantic—an undertaking quite insurmountable with cables as hitherto constructed, and similar to those lately destroyed and abandoned.

The three points to determine, to render such an undertaking feasible and within reason, were—the first cost, the difficulties of working through so long a circuit, and the engineering difficulties of submerging so long a cable, without injury to the integrity of the electrical conductors.

It is needless here to remark, that with submarine cables, as hitherto constructed, none of these requirements could be complied with. The cost would be too much to risk upon one and a doubtful event—the conductive power would be inefficient, whilst the weight, as has already been proved by experience in the Mediterranean (where it was eight tons to the mile), would render the latter proposition an impossibility.

Other means were evidently necessary. The principle of those proposed for the purpose, therefore, differ from all previous, and the following are their comparative attributes—cost about a third, conduction three to fourfold, and weight a sixth or tenth, according to circumstances. The following quotation from your journal, page 514, vol. lxii., briefly explains their general character:

"At the conversazione of the President of the Institution of Civil Engineers, held on Tuesday last, we saw exhibited a submarine electrical conductor, proposed as peculiarly suitable to the project of the Atlantic Telegraph Company, which we find has been provisionally registered in this country. This conductor differs entirely from all other submarine ropes with which we are acquainted, combining considerably increased conductability with such a diminution of weight, that the entire line from England to America may be conveniently carried in one vessel, while its strength bears a very much greater proportion to its weight than is the case with ropes of the common construction. As the cost of construction and laying down such a line of telegraph communication would be but small when compared with the expense necessary for so gigantic an undertaking as the laying down one of the ordinary systems, we hope and expect to hear that the above Company is making progress in the carrying out of its plans."

It will be easily seen that the great principle of construction in these conductors is comparatively great, or quite sufficient strength combined with lightness, and consequently flotation to a certain extent. It is an absurd fallacy, soon to be exploded, the necessity of great weight, and to a second thought of the subject something worse; for if the weight be great, and no amount of flotation, it follows as a necessity that the cable has a tendency to submerge itself perpendicularly or all of a heap; and to prevent that and draw it, and so lay it in a horizontal position, it requires powerful breaks to restrain its outgoing (and which have a tendency to crush and destroy ropes so constructed); but when the depth becomes deeper, and the weight consequently greater, they then either run suddenly out from the breaks, or the breaks, on the other hand, if powerful enough to sufficiently grip the rope under such circumstances, crush it, and so destroy the integrity of the conducting wires within; whereas if the rope, as to weight, be so constituted as to have a relatively greater specific gravity to the water, and no more than required for the purpose of submerging itself gradually, it will follow that such a line may be laid out horizontally, without the use of breaks, inasmuch as it will have no tendency, so to speak, to go down perpendicularly, but will be laid out lengthways on the surface, finding its way to the bottom in that position, it requiring all its weight as a fulcrum and the friction of the water besides on the last few hundred yards to produce force enough to withdraw itself out of the ship. In the plans and arrangements to carry out these principles, the case or conductor is formed either entirely of iron (an iron wire rope), thus forming both the conductor of electricity, and at the same time the strength or backbone of the rope, or, for certain cir-

cumstances, of iron or copper mixed, thus combining the enhanced conductability of the copper with the strength of the iron, so that where weight to carry, and extra conductability, is a lesser object, as in lines of shorter distances, the amount of metal and insulation may be subdivided, and so form several conductors, without diminishing the aggregate strength or flotation; cables combining several conductors, may thus be formed, either with conductors of iron alone, or iron and copper mixed, or with some of the conductors of iron and some of copper, so as without mixing the metals in each conductor, they will be formed of conductors of different metals, still maintaining the above principles; besides rendering the rope cheap, with strength and flotation sufficient for all purposes of submerging with safety.

It will thus be seen, by reference to the date of that patent, that I have stood alone for upwards of two years in trying to introduce the principle of light submarine ropes in lieu of the heavy, expensive, and self-destructive, and which have lately too truly proved the fact.

I am, Sir, yours, &c.,

THOMAS ALLAN.

1, Adelphi-terrace, Strand, London.

THE CONSTRUCTION OF EMBANKMENTS.

To the Editor of the Mechanics' Magazine.

SIR,—In the construction of the embankment of a reservoir, what is the greatest ratio which the *moment* of the pressure of the water in the reservoir, when full, ought to bear to the *moment* of stability of the embankment, in order that it may withstand the pressure of the water, the force of the wind, and the action of the weather, so that the structure may be considered a safe one? If any of your numerous readers would furnish me with the above information, or point out to me any work in which data on the above subject is amply given, I should feel greatly obliged.

I am, Sir, yours, &c.,

A SUBSCRIBER.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PIGGOTT, THOMAS, of Birmingham, Warwick, manufacturer. *An improvement or improvements in telescopic gas-holders.* Patent dated May 21, 1855. (No. 1134.)

This invention consists in locking together the several sliding parts of telescopic gas-holders by self-acting mechanism, in such manner that by the filling of the gas-holder the part last raised shall be fixed to that raised next before it, and on the sinking of the holder, the several parts shall be detached from one another in an order the inverse of that in which they were fastened together.

WHITAKER, HARRY, of Buffalo, New York, U. S. *Improvements in the propulsion of steam vessels by a direct application of a crank outside of the hull to side-screw propellers, such application being combined with a high-pressure engine also outside of the hull.* Patent dated May 21, 1855. (No. 1137.)

The inventor claims what is substantially described in the title.

SILBERMANN, IGNACE JOSEPH, jun., of Paris, France. *Improvements in printing on any kind of surfaces.* Patent dated May 21, 1855. (No. 1139.)

This invention consists in producing a pressure by air, gas, steam, or a liquid, "either through one or several mediums in the interior part of a recipient or holding capacity made wholly or partly elastic, for the purpose of inking or printing on any surfaces either curved or plane!"

COSSUS, ANTOINE FIDELIS, of Cagliari, Sardinia. *Improvements in treating oils and fatty matters.* Patent dated May 21, 1855. (No. 1140.)

The matters are mixed with carbonized peat and schist, and when these have produced their full effect the mixture is run into a filter in which the fluid portions pass through several partitions covered with fabric, and afterwards through unsized paper.

LONGMAID, WILLIAM, of Victoria-cottage, Stoke Newington, and JOHN LONGBOTTOM, of Leeds. *Improvements in heating coppers, pans, and boilers.* Patent dated May 21, 1855. (No. 1141.)

This invention consists in forming coils of hot-water tubing to the external form, or nearly so, of the vessel to be heated, "so that the interior of the vessel will be free when heated by a naked fire or steam jacket."

REY, JOSEPH LOUIS, and ADOLPHE GUIBERT, of Marseilles, France. *A composition to preserve wood and iron, called a submarine and preserving coating.* Patent dated May 21, 1855. (No. 1142.)

This composition is formed of 10 parts of sulphuret of copper, 2 of sulphuret of antimony, and from 5 to 30 of the best varnish. These matters are ground together like paints, and are applied like them to wood or iron.

MENTHA, ALEXANDER HENRY, of Manchester, Lancaster, merchant. *Certain improvements in the manufacture of wadding, and in the machinery or apparatus connected*

therewith. Patent dated May 21, 1855. (No. 1144.)

Claim.—The use of laps or rolls of carded cotton taken direct from the carding engine, for the purpose of manufacturing wadding, and the arrangement of such laps or rolls in such manner that two or more of such laps may be delivered simultaneously, and to their entire length, as well as the use of brushes having either a rotatory or reciprocating motion worked by power for the purpose of glazing or sizing wadding.

MacNaught, William, of Manchester, Lancaster, engineer. *Certain improvements in steam-boilers or generators.* Patent dated May 21, 1855. (No. 1145.)

These improvements are effected by placing the furnaces or fire-places of steam-boilers above the position of the ordinary water-line, or within their upper portions.

Murton, John Mahon, of Somers-place West, St. Pancras, Middlesex, actuary. *Improvements in sister-hooks and thimbles for ships' and boats' riggings, such improvements or parts thereof being applicable also to other purposes where hooks are required.* Patent dated May 21, 1855. (No. 1146.)

The main feature of this invention "is that the hooks are separated or opened broadways only, in place of having a universal motion on their lower ends as in the ordinary 'sister-hooks.'"

Shanks, James, of Arbroath, Forfar, machinist. *Improvements in mowing machines.* Patent dated May 21, 1855. (No. 1147.)

This invention consists in using in mowing machines a front central supporting and guiding roller, connected to the frame of the machine by a swivelling spindle, the connection being adjustable, as to height, so as thereby to regulate the inclination of the machine and the height of cut; and in a mode of constructing mowing machines wherein the front traction rod is connected to the swivelling spindle of a central supporting and guiding roller.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in signals for nautical purposes.* (A communication.) Patent dated May 21, 1855. (No. 1148.)

This invention consists of a diagonal arrangement of lines, strips, or other symbols of different colours upon flags of uniform shape and size, &c.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the process of vulcanizing and rendering hard India-rubber and gutta percha, and in the application of those materials when hard to the construction of parts of machinery or apparatus employed in the preparation and manufacture of fibrous materials and textile fabrics.* (A communication.) Patent dated May 21, 1855. (No. 1149.)

This invention relates to the application of glass as a surface upon which sheets or articles of India-rubber and gutta percha may be placed during the processes of vulcanizing, &c.; and to the application of hard India-rubber or gutta percha to parts of machinery employed in the preparation of fibrous substances and textile fabrics.

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in the construction of watches.* (A communication.) Patent dated May 21, 1855. (No. 1150.)

This invention consists in attaching to the backs of watch-cases folding leaves for winding up the chain and adjusting the hands of watches.

Scott, Henry Emmanuel, of Brixton, Surrey, civil engineer. *Improvements in ships and other floating vessels.* Patent dated May 22, 1855. (No. 1151.)

This invention consists—1. "In making the horizontal sections of a ship of two suitable segments of a common parabola, so that the vertex of each shall be mutually in the same point at the bow, whilst their other extremity shall be mutually in the same point at the stern, and their extreme breadth together shall be equal to that of the ship at the corresponding depth, the usual plan being to place the vertex of the parabolic segments in the opposite sides of the ship. 2. In arranging the extreme widths of the several horizontal sections of the ship in such manner that those above are in advance of, or are ahead of, those beneath, instead of collecting them in one vertical transverse plane commonly called the midship section."

Cruickshank, John, of Marcassie, Elgin, North Britain, farmer. *An improved construction of offensive and defensive equipment for cavalry.* Patent dated May 22, 1855. (No. 1152.)

The inventor proposes to surround the horse with a rigid frame or shield, supported at front by the hame of the horse collar, and at the back by a strap that passes over the hind quarters of the horse. Attached to this frame or shield (which forms a defensive armour to the horse and the lower extremities of the rider) are cutting edges capable of being adjusted to act as offensive weapons during an attack.

Collier, George, of Halifax, York. *Improvements in looms for weaving carpets and other fabrics.* Patent dated May 22, 1855. (No. 1153.)

This invention, which relates principally to the weaving of wide carpets, consists in the application of a trough capable of receiving and giving support, either continu-

ous or at intervals, to each wire in the direction of its length, when the wires are withdrawn in succession from the fabric by the same instrument by which their re-insertion is effected.

HOLLAND, HOMER, of Westfield, Massachusetts, U. S., physician. *Improvements in the method of treating metalliferous sulphurets.* Patent dated May 22, 1855. (No. 1154.)

"I have discovered," says the inventor, "and am able to make use of certain properties in the nitrate of soda which render it highly useful in the disintegration and resolution of metalliferous sulphides, and which show that it is very different in its action from the nitrate of potash. Unlike the last-mentioned salt, the nitrate of soda, when ignited, burns slowly and mildly, and more especially so with the metalliferous sulphides, while there is neither violent action to explode or scatter the mixture, nor heat sufficient to volatize the metals.

MORGAN, JOSEPH, of Manchester, manufacturer of plaited wicks. *An improvement in the manufacture of plaited or platted wicks used in the making of candles.* Patent dated May 22, 1855. (No. 1156.)

Claim.—The manufacture of platted or plaited wicks with not more than four links, plaits, or plats to the inch, when in the natural or undistended state.

MEYER, JOHAN JACOB, of Rochdale, Lancaster, cabinet-maker. *Improvements in machinery or apparatus for shaping wood and other materials.* Patent dated May 23, 1855. (No. 1157.)

This invention consists—1. In the employment of a stationary cutting or scraping tool, against which the material is caused to travel, and at the same time to rise and fall, designs being thus produced in different degrees of relief. 2. In the use of a cutting or scraping tool operating upon the material, which is caused to move sideways by a template or other such apparatus. 3. The construction of certain rotary tools.

EDEN, JAMES, of Lytham, Lancaster, bleacher. *An improved mode of drying fabrics.* Patent dated May 23, 1855. (No. 1159.)

This invention consists in admitting air into the spaces between the heated chests of drying stoves through which fabrics are conveyed.

LEESHING, FRANCIS, of Busby, near Glasgow, Lanarkshire, chemist. *An improved method of preparing or treating certain dye-stuffs, so as to obtain greater dyeing power.* Patent dated May 23, 1855. (No. 1160.)

Claim—The boiling or heating with acids (either alone or subsequently to the use of alkalies) of dye-stuffs other than madder-root, &c., and the application of the materials obtained after the boiling and separating from the acid liquors as improved dye-stuffs.

DAVIS, DAVID L., of Dedham, Massachusetts, U. S. *An improved method of applying elastic bearings to railroad chairs and rails.* Patent dated May 23, 1855. (No. 1161.)

This invention consists in confining the India-rubber sometimes employed in laying down a permanent way between plates placed upon every side, in such manner that while it shall be free to yield in a vertical direction, it shall be subjected to no friction between the surfaces above and below it.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Certain improvements in bee-hives.* (A communication.) Patent dated May 23, 1855. (No. 1163.)

The inventor employs in beehives a gauze platform, to ventilate not only the feed-drawer, but also the main hive chambers, and also to allow the filth from the boxes to pass down into the drawers disposed within the box platform and under its top. The wire-gauze platform also serves to prevent the millers from passing from the miller drawers up into the hive.

SMITH, WILLIAM, of Salisbury-street, Adelphi, Middlesex. *Improvements in safety apparatus for mine-shafts and other hoists.* (A communication.) Patent dated May 23, 1855. (No. 1164.)

This invention consists in the combination of bent lever arms with and between the corve tub or cage frame and the slings which suspend it, which arms are mounted and move so that the grippers formed by their short ends come into close contact with the guides immediately after their longer ends are released.

SMITH, WILLIAM, of Salisbury-street, Adelphi, Middlesex. *A safety apparatus for steam boilers.* (A communication.) Patent dated May 23, 1855. (No. 1165.)

This invention mainly consists in the application of a permanent magnet contained within a steam-tight case, for acting upon or suspending a needle or pointer outside of such case, for indicating the level of the water contained within a vessel; and in a duplex arrangement by which the maximum and minimum levels of the water call into action the whistle alarum.

SMITH, WILLIAM, of Snow-hill, London, and NATHANIEL FORTESCUE TAYLOR, of Gloucester-terrace, Park-walk, Chelsea, gas-engineers. *Improvements in meters for measuring gas and other fluids.* Patent dated May 24, 1855. (No. 1166.)

This invention mainly consists in forming the valves and valve-seats of meters for measuring gas so that each valve-cover in

action has a partial rotary motion on its seat; and in forming the seat (for two measuring compartments of the meter) with four passages or ways of two unequal sizes, each valve-cover being formed with two corresponding compartments and two blanks.

LONGRIDGE, JAMES ATKINSON, of Newcastle-upon-Tyne, engineer. *Improvements in the construction or the manufacture of guns and artillery, and of other vessels intended to resist great pressure.* Patent dated May 24, 1855. (No. 1167.)

The inventor employs wires, rods, or bars, arranged in such manner that the strains upon the parts shall be tensile or nearly so.

PARK, JAMES, of Bury, Lancaster, engineer. *Improvements in machinery for manufacturing paper pulp.* Patent dated May 24, 1855. (No. 1170.)

This invention consists in setting a rag-engine in motion by means of a steam-engine applied directly to its shaft.

RAWLINGS, CHARLES, of Sherborne, Dorset. *Improvements in writing-desks.* Patent dated May 24, 1855. (No. 1172.)

These improvements consist "in the combination of envelope and paper cases with the ordinary portable writing-desk, so as to form one and the same article."

MUIR, GEORGE WALKER, of Glasgow, Lanark, and MATTHEW GRAY, of Bonhill, Dumbarton, Scotland, engineers. *Improvements in admitting and regulating the admission of air to furnaces.* Patent dated May 24, 1855. (No. 1173.)

In this invention the air is admitted to the fire-place through a series of openings, capable of being partially or entirely closed by a sliding cover directly connected to the rod of a piston which works in a closed cylinder.

ADDENBROOKE, JOSEPH, of Bartlett's-passage, London, envelope-maker. *Improvements in machinery for folding envelopes.* Patent dated May 24, 1855. (No. 1179.)

These improvements consist in adding to the machinery at present in use for folding envelopes an apparatus for stamping devices, and for printing on the envelopes during the operation of folding.

HORROCKS, GEORGE, of Pilkington, Lancaster, shuttle maker. *Certain improvements in shuttles.* Patent dated May 24, 1855. (No. 1180.)

This invention consists in furnishing the shuttle with a spring of peculiar construction which shall act against the tail of the "skewer," in such manner that upon the skewer being raised to the perpendicular, in order to put the "cop" on, it shall be held firmly in that position, and upon its being replaced within the shuttle in a horizontal position, it shall also be retained there.

HASELER, EDWIN, of Wolverhampton, Stafford, artist. *An improvement or improvements in frames for pictures, drawings, engravings, and other similar articles.* Patent dated May 25, 1855. (No. 1181.)

This invention consists in constructing such frames "upon the glass and back board of the drawing as a foundation," the sides being made to grasp the edges, and held together by corner pieces connected at the back of the frame.

MELVILLE, ALEXANDER, of Baker-street, Portman-square, Middlesex, artist. *Improvements in breech-loading fire-arms, and in projectiles used therewith.* Patent dated May 25, 1855. (No. 1183.)

Claims—1. The construction of a solid moveable breech piece, together with a general arrangement of parts to be used in combination therewith. 2. Certain peculiar constructions of projectiles as described.

POULLAIN, JOSEPH HIPPOLYTE, of Paris, France. *A new or improved pen-holder.* Patent dated May 25, 1855. (No. 1185.)

This invention relates to penholders so constructed as to retain the pen in a firm position, and also to prevent it, by means of a flange, from staining the surface upon which it is laid.

ALDRIDGE, EDWARD, of Boston, Lincoln, manager of the Boston Water-works. *Improvements in meters for measuring the flow of liquids and fluids, which can also be employed for obtaining motive power, and in taps for regulating the flow of liquids.* Patent dated May 25, 1855. (No. 1186.)

An illustrated description of this invention will be published hereafter.

HENSON, HENRY HENSON, of Parliament-street, Westminster, engineer. *An improvement in the manufacture of fabrics suitable for goods wrappers, and other purposes for which canvas has been or may be employed.* Patent dated May 25, 1855. (No. 1187.)

Claim.—The employment of wire coated or covered with a material or composition to prevent oxidation, together with fibrous threads, in the manufacture of fabrics suitable for goods wrappers or other purposes for which canvas has been or may be employed.

ALLEN, JOHN, and WILLIAM ALLEN, of Wallsend, near Newcastle-on-Tyne. *An improvement in applying heat to alkaline solutions, and to drying and making alkaline salts.* Patent dated May 25, 1855. (No. 1188.)

The inventors propose "to apply the

waste heat of coke ovens in evaporating to dryness alkaline solutions, and in drying, wasting, carbonating, and making alkaline salts."

WAITHMAN, ROBERT WILLIAM, of Bentham-house, York, and JOSEPH WAITHMAN, of Manchester, Lancaster. *Improvements in machinery or apparatus for the manufacture of lint or similar substances.* Patent dated May 26, 1855. (No. 1190.)

A full illustrated description of this invention was given at page 387 of the current volume (No. 1681.)

MABERLY, FREDERICK HERBERT, of Stowmarket, Suffolk, clerk. *Improvements in fire-arms.* Patent dated May 26, 1855. (No. 1191.)

Claim. — Certain mechanical arrangements by which the charge of fire-arms is carried from the butt to and into the breech of the gun, and by which the cartridge is delivered from the gun simultaneously with the explosive material.

MATHER, THOMAS, of Preston, Lancaster, engineer. *Improvements in the construction of pistons.* Patent dated May 26, 1855. (No. 1193.)

This invention consists in the construction of metallic packing rings with oblique in place of radial junction ends, such ends being made to overlap each other.

YOUNG, WILLIAM SIMSON, of Leith, Mid Lothian. *Improvements in steam boiler furnaces, and in the prevention of smoke therein.* Patent dated May 26, 1855. (No. 1195.)

This invention consists in arranging two or more furnaces in combination with a single mixing chamber or main flue, such furnaces being fired alternately, and supplying such mixing chambers with atmospheric air by tubes passing through the boiler.

ASPINALL, JOHN, of Fenchurch-street, London, civil engineer. *Improvements in machinery for extracting moisture from substances, and for separating liquid from solid bodies, applicable to the refining of sugar, drying of goods, and to purposes for which centrifugal machines are employed.* Patent dated May 26, 1855. (No. 1196.)

This invention consists in placing a perforated or wire gauze cylinder or drum, open at both ends, horizontally or in an inclined position, in causing the same to rotate by frictional contact with driving rollers, or by strap pullies, to which motion is communicated from a steam engine or other prime mover, and in introducing through the centre of this cylinder a perforated pipe, which is stationary, and to which, for some purposes, a series of inclined directing plates is fitted. Or instead of fixing the inclined directing plates upon the perforated pipe, the invention consists in introducing a fixed shaft or spindle through the centre of the drum or cylinder, and in fixing the inclined directing plates thereon.

RICU, JEAN CIANCALEONE, and CARLO BARTOCCI, of Fuligno, in the Papal States. *A new beverage.* Patent dated May 26, 1855. (No. 1198.)

This invention consists in obtaining a beverage similar in taste and appearance to wine from tamarinds combined with any sweet alcoholic substance and water.

HARRISON, CHARLES WEIGHTMAN, of Woolwich, Kent, civil engineer. *Improvements in metal ropes, cables, and rods, and in machinery for manufacturing the same.* Patent dated May 26, 1855. (No. 1199.)

Claims.—1. The employment of angular metal plates, strips, or ribbons in the construction of metal ropes and cables, when such plates, strips, or ribbons are placed together, side by side, parallel with the axis of the rope or cable. 2. The construction of hollow ropes and cables, formed by laying or winding wires, plates, strips, or ribbons of metal upon or around a hollow flexible tube or pipe. 3. The employment of metal ribbons or sheets of any proportions or dimensions, in the construction of that kind of metal rope which is formed by successive layers of opposite spirals, the use of ribbons or sheets for such purpose being attended with peculiar advantages. 4. The employment in the construction of metal ropes and cables for electric communication of insulated conducting wire, inclosed in a tube or pipe of lead or other flexible metal. 5. A mode of manufacturing metal rods, both solid and hollow, by employing any number of metal plates or strips, of the form and in the manner described. 6. A certain described mode of connecting or joining together separate lengths of ropes or cables, constructed as described in the first part of the invention. 7. A method of twisting or laying spirally together strands of wire and insulated conducting wires in telegraph ropes or cables, by placing a much greater strain or tension on the wire strands than on the insulated conducting wires during the process of manufacture; and, 8. Certain machinery described for manufacturing metal ropes, cables, and rods, in so far as regards the mode of preventing metal plates, ribbons, strips, or sheets from becoming twisted in themselves by passing them through angular formed grooves or holes in plates, cones, or antifriction rollers, and the mode of varying the speed in the motion of the discs, so that different breadths of materials may be simultaneously employed to form spiral coverings in or around a rope, cable, or rod.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Improved machinery for making envelopes.* (A communication.) Patent dated May 26, 1855. (No. 1200.)

This invention relates first to an automatic sizing of the envelope previous to its being put on a rotatory plate mentioned hereafter; second to a mechanical taking of the paper in order to bring it on the said rotatory plate; third to an arrangement in which the mechanical folding of the envelope is effected by the use of a rotatory plate or table, &c.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *A new apparatus for regulating the speed of steam engines.* (A communication.) Patent dated May 26, 1855. (No. 1201.)

The principal feature of this invention consists in the application of a throttle and cut-off valves for the purpose of controlling the supply of steam to the engine by the velocity of the current of steam in the steam pipe.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BENNETT, EDWARD HOLMES, of Birmingham, Warwick, manufacturer. *Improvements in roasting jacks.* Application dated May 21, 1855. (No. 1135.)

In this invention the rotatory motion of the axis on which the main spring acts is converted into an alternating motion by means of a crank, and the latter motion is communicated to the line on which the joint is hung by means of a worm or screw.

CURTIS, WILLIAM JOSEPH, of Hardinge-street, Islington, engineer. *Improvements in ærostation or æronautics and the mechanism connected therewith, which improvements may be rendered subservient to purposes of navigation.* Application dated May 21, 1855. (No. 1136.)

This invention consists in employing the vapour of gunpowder or of a similar compound to inflate balloons; also in connecting with balloons, kites or wings to be acted upon by suitable cords, so that the motions of the whole may be governed by operators stationed below.

RAVENSTIN, LOUIS FREDERICK ISIDORE, merchant, and CHARLES CHATEL, designer, of Paris, France. *Improvements in the manufacture of blinds, screens, reflectors, and other articles of a similar nature.* Application dated May 21, 1855. (No. 1138.)

These improvements consist in producing designs on blinds, &c., by cutting out openings in the fabric which is to form the ground of the design, these openings being covered with fabrics of different colours.

SHAW, THOMAS GEORGE, of Old Broad-street, London, wine merchant. *An improved conductor to be used in the decantation of wine or other liquids.* Application dated May 21, 1855. (No. 1143.)

This invention consists of a tubular instrument like a hollow cork, which is to be inserted in the neck of the bottle after its cork is drawn, and is provided with a small inner orifice for the insertion of an air tube.

HOLT, THOMAS, of Blackburn, and JOHN SAGAR, of Cabin-end, near Blackburn, Lancaster. *Improvements in looms.* Application dated May 22, 1855. (No. 1155.)

This invention relates to improvements in the mode of working the picker, and consists in using a strap, with two loops or projections. This strap is fastened to the extreme end of the back board of the shuttle box in which there is a horizontal slot, the loops sliding in this slot with the picker between them.

OCHS, LAZARE, of Saint Josse ten Noode, near Brussels, Belgium, lace manufacturer. *Improvements in the manufacture of certain kinds of paper from the refuse and cuttings of leather during the operation of tanning.* (A communication.) Application dated May 23, 1855. (No. 1158.)

In order first to disengage the cuttings from the tanning with which they are impregnated, the inventor passes them through a cylindrical vessel, fitted with wire-work, and, when necessary, further places them in baskets, which are then plunged in water and shaken. When sufficiently prepared the material is mixed with about twenty per cent. of cord or other cuttings, well separated; the whole is then worked with a paste from which it is converted into paper.

McLOW, THOMAS, of Staples Inn-buildings, Holborn, London. *Certain improvements in paddle-wheels.* Application dated May 23, 1855. (No. 1162.)

According to this invention an eccentric is made to move in a horizontal and vertical direction, causing the floats to assume any required angle when entering the water. The movement of the eccentric is effected by the use of levers, screws, or cog wheels.

SEEGERS, AUGUSTE FREDERIC GODFRID, leather printer, of Paris, France. *Improvements in the manufacture of hangings of paper and of textile fabrics.* Application dated May 24, 1855. (No. 1163.)

These improvements consist in printing in gold, silver, copper, or colours upon flock hangings, by means of blocks of copper engraved *en creux*, or in relief, and impressed hot upon the paper or fabric.

MITCHELL, JOHN, of Bury, Lancaster, roller and spindle maker, and JAMES ENTWISLE, of the same place, foreman. *Improvements in presser flyers for roving frames and other machines of the like nature.* Application dated May 24, 1855. (No. 1169.)

These improvements consist in making the bearing through which the vertical shank of the presser passes with an inclined surface on which a projection from the presser shank acts. A spring of wire is coiled round the shank of the pressure, and abuts against the bearing.

HUDSON, JOSHUA, of Laurel-place, Dalston, Middlesex, and GEORGE ROBERT WILLIAMS, of Stanley-street, Chelsea, Middlesex. *Improvements in water-meters, which are applicable also for the measurement of other fluids.* Application dated May 24, 1855. (No. 1171.)

This invention mainly consists in mounting one cylindrical case eccentrically within another, the form of the outer measuring case being such that a straight line drawn through the centre of the inner one touching the outer cylinder at each end is precisely the same length in whatever direction it is drawn. Two opposite pistons or diaphragms are placed in connection with each other by rods, and are carried round by the inner cylinder, &c.

CHASE, OLIVER RICE, of Boston, United States of America. *A machine for making confectioners' "pipe," and for other purposes.* Application dated May 24, 1855. (No.1176.)

This invention consists in an arrangement of endless aprons in conjunction with a knife or cutter, by means of which any suitable substance is cut into strips and rolled into cylinders.

McLOW, THOMAS, of Staples Inn-buildings, Holborn, London. *Certain improvements in paddle-wheels.* Application dated May 24, 1855. (No. 1178.)

In the inventor's paddle-wheel the floats are fixed at an angle one with the other, but not touching, so that when one float is about three-fourths immersed the next touches the water.

GREENHOW, THOMAS MICHAEL, of Newcastle-upon-Tyne, Northumberland. *Improvements in constructing and protecting the bottoms and sides of iron ships.* Application dated May 25, 1855. (No. 1182.)

The inventor employs a coating composed of ground glass, borax, and soda, or other vitreous mixture capable of being fused upon the surface of the iron. He covers the plates used in the construction of iron ships with thin plates of iron coated with the silicious or glassy surface, in such manner as to include the rivet heads and protect the whole of the bottoms and sides.

PARIENTE, LEON DE, of Rue de Brabant, Faubourg de Schaerbeek, Brussels, Belgium. *Improvements in cutting or sawing wood.* (A communication.) Application dated May 25, 1855. (No 1184.)

This invention consists in making a ribbon saw having both ends welded together, so as to form an endless band which is placed round two pullies.

JACCARD, AUGUSTE PAILLARD, of Sainte Croix, Switzerland, watchmaker. *An improved independent centre seconds movement for watches.* (A communication.) Application dated May 25, 1855. (No. 1189.)

In this invention the spindle of the seconds hand receives its motion from the fourth wheel, by means of a pressure spring that drives it by friction of contact. On the top of the arbor of the fourth wheel is loosely mounted a spur wheel, the boss of which is made hollow, to receive a coiled spring fixed to the arbor of the fourth wheel, and pressing against the inner periphery of the boss. A cap which covers the boss carries the central spindle for the seconds hand, and the continuous rotary motion which the fourth wheel is calculated to impart to the wheel with the hollow boss is converted in the usual way into a motion by pulsations.

LORAND, JOHN LEUTHNER, of William-street, Hampstead-road, Middlesex. *An improved railway break.* Application dated May 26, 1855. (No. 1192.)

This invention consists "in the application of the resisting force of air or other elastic fluid subjected to compression" to the stopping or retarding of trains.

MACLAREN, ROBERT, of Glasgow, Lanark, engineer. *Improvements in furnaces, and in the consumption or prevention of smoke.* Application dated May 26, 1855. (No. 1194.)

This invention relates to the intermittent application of heated air in furnaces or fireplaces, by means of hollow fire-bars leading from a chamber in front.

PARENT, ALFRED ISIDORE HONORE, manufacturer, of Paris, French Empire. *Certain improvements in manufacturing buttons, nails, and metallic and plastic articles.* Application dated May 26, 1855. (No. 1197.)

The inventor first cuts out a blank in metal, or in a plastic substance, as the case may be, of the weight of the article to be produced, and places this blank in a hollow mould to rough shape the article, and then in a second mould to form it into its finished shape. The mould with the blank in it is subjected to strong pressure by a stamping press or otherwise, whereby it is drawn out under pressure, and made to assume the internal configuration of the mould. The shank, in the case of buttons, is afterwards pierced by a punch or otherwise.

PROVISIONAL PROTECTIONS.

Dated September 6, 1855.

2018. Charles Pryse, of Birmingham, Warwick, gun-manufacturer, and Paul Cashmore, of West Bromwich, Stafford, pistol manufacturer. Certain improvements in repeating fire-arms.

Dated October 18, 1855.

2336. Samuel Statham, of Islington, Middlesex, gentleman. Improvements in electric telegraph cables.

Dated November 13, 1855.

2550. Robert Tempest and James Tomlinson, machinists, and Richard Hampson and John Hampson, spinners and manufacturers, all of Rochdale, Lancaster. Certain improvements in looms for weaving, which improvements are applicable to working the valves of steam-engines.

Dated November 19, 1855.

2599. Thomas Culpin, of Royal-hill, Greenwich, Kent, engineer. An improved apparatus for regulating the supply and discharge of fluids and gases.

2601. Josiah Pratt, of Bath-street, City-road, Middlesex, and Thomas Radcliffe, of Shaftesbury-street, Hoxton, Middlesex. Improvements in the manufacture of brushes.

2603. John Silvester, of West Bromwich, Stafford, engineer. Improvements in steam-gauges and safety-valves.

2605. John McNicol, of Manchester, Lancaster, designer. Improvements in machine or cylinder printing.

2607. Michel Pierre Alexis Gilardeau, of Rue de l'Echiquier, Paris. A new motive power.

Dated November 20, 1855.

2609. Theodore Schwartz, of New York, United States. Improvements in drying, heating, and melting solid and plastic bodies.

2611. George Geyelin, civil engineer, of Melville-terrace, Camden-road, Middlesex. Propelling vessels by means of pistons, which he calls anti friction propellers, to supersede paddle-wheels, screws, and all other contrivances at present in use.

2613. Francis Puls, of Soho-square, Middlesex, chemist. A new electric light and heat.

2615. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in apparatus for preventing horses from running away. A communication.

2617. Edward Orange Wildman Whitehouse, of Brighton, Sussex, surgeon. Improvements in electro-telegraphic apparatus, parts of which are also applicable to other purposes.

2619. David Simpson Price, of South Moulton-street, Middlesex, consulting chemist, and Edward Chambers Nicholson, of Newington-crescent, Surrey, manufacturing chemist. Improvements in the manufacture of cast steel.

2621. George Senior Tolson, Robert Henry Tolson, and Joseph Senior Tolson, of Dalton, York, manufacturers, and Thomas Irving, of Mold-green, Dalton, dyer. Improvements in producing metallic lustre to yarns and fabrics. A communication.

Dated November 21, 1855.

2625. Armand Jean Baptiste Louis de Marcesheau, of Paris, ancient consul general. Improvements calculated to increase the efficiency or working power of steam-engines.

2627. William Munslow, of Miles Platting, Lancaster, moulder, and Henry Wallwork, of the same place, moulder. Improvements in railways.

2629. Thomas Wright Gardener Treeby, of Westbourne-terrace-villa, Westbourne-terrace North, Paddington. Improvements in revolving fire-arms.

Dated November 22, 1855.

2631. John Roberts, junior, of Whitechapel-road, Middlesex, tobacco-manufacturer. A machine or apparatus for cooling tobacco during the process of manufacture.

2633. Edmund Calvert, of Walton-le-Dale, Lancaster, and Sidney Ashton Smith, of the same place, manager. Certain improvements applicable to carding-engines.

2636. Frederic Lotteri, of Bergamo, Lombardy. Obtaining fibre from the bark of trees of the Morus family or class, and the application thereof to the manufacture of paper and textile materials, and for other useful purposes.

2637. Charles Tennant Dunlop, of Glasgow, Lanark, chemist. Improvements in the manufacture or production of artificial oxide of manganese.

2639. Charles May, of Great George-street, Westminster, civil engineer, and Paul Prince, of Derby. Improvements in the manufacture of spikes and trenails.

Dated November 28, 1855.

2690. James Walker, of Leeds, York, cloth-manufacturer and merchant. Improvements in the manufacture of textile fabrics.

Dated November 29, 1855.

2696. Charles Maybury Archer, gentleman of the press, of St. James-gardens and Haverstock-hill, Middlesex. A new material for the manufacture of paper.

Dated December 1, 1855.

2710. John Gardner, of Mortimer street, Cavendish-square, Middlesex, doctor of medicine. A method of treating tea for economizing its use and transport.

Dated December 4, 1855.

2724. Etienne André Napoleon Brécheux, manufacturer, of Paris, French empire. An improved axletree for carriages.

2726. William Foot, of Wellington, Somerset. An instrument for moving and stopping trucks and other carriages on railways.

2728. Jean Davoust, of the Hotel des Invalides, Paris. Improvements in cartridges. A communication.

2730. John Marsh, of Nottingham. Improvements in the manufacture of looped and pile fabrics.

Dated December 5, 1855.

2732. John Moffat, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of metallic spoons, forks, and ladles.

2734. William Nunn, of Church-street, Hackney, Middlesex, picture-frame and looking-glass manufacturer. An improved table, washstand, mirror, &c., combined in one piece of furniture.

2736. William Beatson, of Rotherham, York, manufacturing chemist. Improvements in treating borates of lime and magnesia, and a new composition formed therewith, suitable for glazing and other purposes for which borax has been or may be employed.

2738. William Smith, of Margaret-street, Cavendish-square, Middlesex, engineer. The improvements in apparatus for regulating the supply of air to furnaces.

2740. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in apparatus for dressing cloth. A communication from Mr. Nos d'Argence.

Dated December 6, 1855.

2744. William Mosley, of Salford, Lancaster, bleacher. Improvements in machinery or apparatus for stretching and finishing woven fabrics.

2746. John Barrow, junior, of Manchester, Lancaster, manufacturing chemist. An improved process of manufacturing soda and sulphuric acid.

2748. Thomas Dunn, of Glasgow, Lanark, stationer. Improvements in fire-arms.

2750. John Cornes, of Swan-lane, London, engineer. An improved mangle or press, parts of which are applicable to rollers employed for pressure purposes generally.

2752. Johannes Neuenschwander, of Berne, Switzerland, proprietor of the Whey establishment of Harvstehude, near Hamburg. Certain improvements in the process of preparing what is called "Swiss whey," from milk.

2754. Thomas Russell Crampton, of the Adelphi, Middlesex, civil engineer. An improvement in furnaces and in apparatus for supplying fuel thereto.

2756. Frederick Samson Thomas and William Evans Tilley, of Kirby street, Middlesex. Improvements in producing aluminium and its alloys and in platin; or coating metals with aluminium and alloys composed of aluminium and other metals.

Dated December 7, 1855.

2758. Jean Joseph Emillien François Kuister, of Lyons, France. Improvements in raw silk winding machinery.

2760. Henry Hart, of Waterloo crescent, Dover, Kent, gentleman. A ship leakage indicator. A communication.

2762. James Gardner, of Plaistow, Essex, gentleman, and Henry Gardner, of Leytonstone-road, gentleman, and John Carey Gardner, of Leytonstone-road, gentleman. Improvements in glasses as applied for the transmission of light.

2764. Charles Lenny, of Croydon, Surrey. Improvements in carriages.

2766. John Allin Williams, of Baydon, Wilts, farmer. Improvements in machinery or apparatus for cultivating land.

2768. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of iron.

2770. Charles Edmund Green, of Blandford-street, Portman-square, Middlesex. Improvements in huts, tents, and camp hospitals.

Dated December 8, 1855.

2772. Joseph Hacking, of Bury, Lancaster, machinist. Improvements in machinery for supplying fuel and air to furnaces.

2774. John Radcliffe, of Rotherham, York, grocer, and Thomas Vickers Favell, of the same place, gentleman. Improvements in machinery or apparatus for cutting sugar and other substances.

2776. Andrew Tevindale, of Wellington-buildings, Liverpool, Lancaster. Improvements in propelling, and in the construction of steam or other vessels.

2778. Andrew Maclure, of Walbrook, London. Improvements in lithographic printing presses.

Dated December 10, 1855.

2782. Thomas Heppleston, of Manchester, Lancaster, machinist, and John Hunter, of the same place, machinist. Certain improvements in machinery or apparatus for stretching and finishing yarns or threads.

2784. David Parsons, of Pensnett, near Dudley, Worcester. An improved brake for arresting or retarding at will the motion of locomotive and other engines and revolving machinery.

2786. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in manufacturing gas from peat, and in treating hydrogen gas, in order to render it illuminating. A communication from C. M. I. de Flers, of Paris.

2788. Josiah George Jennings, of Great Charlotte street, Blackfriars-road, Surrey. Improvements in connecting earthenware rain pipes and soil pipes of water-closets, and in valve water-closets.

Dated December 11, 1855.

2790. Bernard Hughes, of Rochester, New York, United States. A machine for making spokes and tool handles. A communication.

2794. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, sworn interpreter, Imperial Court of Paris. Certain improvements in mariners' and land compasses. A communication from John Prime, Washington, United States.

2796. James Cliff, of Burton-on-Trent, Stafford, engineer. Improvements in or additions to furnaces.

2798. Reuben Levy, of Manchester, Lancaster, manufacturing clothier. An improvement in wearing apparel.

2800. René Simon Bouët and Henri Emile Isidore Douein, of Paris, chemists. Improvements in the preservation of meat and other animal substances serving for food.

2802. Alexander Forot, of Paris. Improvements in parasols.

2804. Rogers Ruding, of Bunhill-row, London. An improvement in printing silks and other woven fabrics with gold and other metal leaf or powder.

Dated December 12, 1855.

2806. Martin Billing, of Birmingham, Warwick, stationer, and Walter George Whitehead, of Birmingham, manufacturer. A new or improved waterproof fabric or material.

2808. George Heron Hay and David Syme Hay, of Edinburgh, Mid Lothian, photographic artists. Improvements in photographic pictures.

2810. William Leighton, of Newcastle-upon-Tyne, general broker. Improvements in paddle-wheels.

2812. Thomas Rickett, of Stony Stratford, Buckingham, engineer. Improvements in pressure gauges.

Dated December 13, 1855.

2814. David Hart, of Trinity-square, Middlesex, gentleman. Improvements in signalling or communicating between parts of a railway train, and in the instruments and apparatus employed for such purpose.

2816. Alphonse Louis Poitevin, civil engineer, of Paris, French Empire. Improved photographic engraving.

2818. George Skelton, of Lambeth, Surrey, engineer. An improved projectile.

2820. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in apparatus for containing and distributing aeriform fluids under pressure. A communication from John Cockerill, of Seraing, Belgium.

2822. George Hall Nicoll, of Dundee, Forfar, ironmonger. Improvements in fire-places or heating apparatus.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2835. Ebenezer Rogers, of Abercarn, Monmouth, mining engineer. Improvements in safety doors for mines. December 15, 1855.

NOTICE OF APPLICATION FOR LEAVE TO FILE MEMORANDUM OF ALTERATION

An application will be made to the Attorney General by Andrew Lawson Knox, of Glasgow, manufacturer, for leave to file a memorandum of alteration of part of the specification of the patent granted to him November 5, 1852, for "Improvements in the manufacture or production of ornamental fabrics."

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December 25th*, 1855.)

1806. Thomas Sleight. An improved compound for curing disorders of the bowels, cholera, diarrhœa, and dysentery.

1836. Robert Blackburn and William Lundi Duncan. Improvements in bleaching.
1840. John Venables. Improvements in ornamenting articles made of clay and other similar plastic materials.
1853. John Barber. Certain improvements n steam engines.
1866. William Maynes. Certain improvements in self-acting temples, to be used in weaving.
1888. Robert Longsdon. Improvements in apparatus to be used for removing property into and out of strong rooms, and in the mode of securing such property from fire or theft.
1890. George Lewis. Improvements in gloves cut out with a knife and rotary press.
1891. John Cornes. An improved method for consuming smoke.
1898. Charles Van den Berg. An improvement in the mode of packing pistons of steam and other engines.
1915. William Wood. Improvements in the manufacture of pile and other fabrics.
1921. C. Schlickeysen. Improvements in machinery for manufacturing pipes, bricks, and tiles.
1926. William Brown. Improvements in the manufacture of paper bags.
1927. Charles Frederick Stansbury. An improved mill for grinding. A communication.
1928. Charles Frederick Stansbury. An improved shirt wristband. A communication.
1943. Charles Esplin. Improvements in apparatus for regulating the supply of gas.
1964. Paul Eugène Charton. An improved metallic manometer.
2027. John McIntyre. Improvements in apparatus for caulking decks, ceilings, and floors.
2115. William Rothwell Lomax. Improvements in steam engines.
2336. Samuel Statham. Improvements in electric telegraph cables.
2597. George Collier and James William Crossley. Improvements in means or apparatus employed in hot pressing woven fabrics and other surfaces.
2598. George Collier and James William Crossley. Improvements in finishing fabrics and in treating yarns, part of which improvements is also applicable to producing ornamental effects upon other surfaces.
2605. John McNicol. Improvements in machine or cylinder printing.
2614. William Harvey. An apparatus to be employed with reels, cylinders, or rollers, and for placing upon or taking off therefrom hanks, skeins, bands, and other articles without removing such reels, cylinders, or rollers from their bearings.
2617. Edward Orange Wildman Whitehouse. Improvements in electro-telegraphic apparatus, parts of which are also applicable to other purposes.
2619. David Simpson Price and Edward Chambers Nicholson. Improvements in the manufacture of cast steel.
2621. George Senior Tolson, Robert Henry Tolson, and Joseph Senior Tolson, and Thomas Irving. Improvements in producing metallic lustre to yarns and fabrics. A communication.
2626. Peter Armand Le Comte de Fontaine Moreau. Improvements in treating fatty acids. A communication.
2628. Henry William Wimshurst. Improved machinery for cutting dovetails and tenons.
2670. Enoch Tayler. Improvements in paddle-wheels for propelling vessels in water.
2688. William Alfred Distin. Improvements in cornets and other wind musical instruments.
2706. Samuel Cunliffe Lister. Improvements in treating so as to rework waste yarns of cotton, silk, flax, wool, or other fibre.
2728. Jean Davoust. Improvements in cartridges. A communication.
2748. Thomas Dunn. Improvements in firearms.
2752. Johannes Neuenschwander. Certain improvements in the process of preparing what is called "Swiss whey," from milk.
2774. John Radcliffe and Thomas Vickers Favell. Improvements in machinery or apparatus for cutting sugar and other substances.
2796. James Cliff. Improvements in or additions to furnaces.
2808. George Heron Hay and David Syme Hay. Improvements in photographic pictures.
2820. John Henry Johnson. Improvements in apparatus for containing and distributing aeriform fluids under pressure. A communication.
2822. George Hall Nicoll. Improvements in fire-places or heating apparatus.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

1093. William Wilkinson.
1100. William Robertson.
1116. George Gwynne, and George Fergusson Wilson.
1147. George Gwynne, and George Fergusson Wilson.
1170. George Fergusson Wilson.
1171. George Gwynne, and George Fergusson Wilson.

LIST OF SEALED PATENTS.

Sealed December 21, 1855.

1423. Jacob Ben'Jamin.
1441. Thomas Walker.
1443. William Pearce.
1445. Ignace Joseph Silbermann.
1457. James Ronald.
1459. Benoit Bonnet.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Nov. 22	3786	Key and Co.	Charing-cross	Solocornu.
26	3787	J. Jones and Son	Bow-street	Gas Torch.
27	3788	F. Jackson	Derby	Office Almanack.
,,	3789	A. J. Melhuish	Blackheath	Part of a Camera.
28	3790	Turner and Pegg	Leicester	Clasp-Fastening.
Dec. 5	3791	G. Gledhill	Huddersfield	Wind-Guard.
6	3792	G. Grout	Tottenham	Cotton Armlet.
,,	3793	R. D. Charles	Bristol	Pair of Trowsers.
10	3794	D. W. and T. Bentley	Margate	Potatoe Steamer.

Dec. 12	3795	G. A. Chambers	Finsbury	Perambulator.
15	3796	E. Israel	St. Mary-axe	Flower-Pot.
17	3797	A. Grant Brothers	Wood-street	Volkommon Shirt.
21	3798	Page and Gurling	Melton, Suffolk	Vegetable Cutter.

PROVISIONAL REGISTRATIONS.

Nov. 28	715	J. and J. Foxeland	Hackney-wick	Cigar Box.
,,	716	O. Palmer	Oxford-street	Buckle Strap.
29	717	W. F. Taylor	Windsor	Ladder Shop Stool.
Dec. 4	718	Lieut. P. Harris	Chatham	Service Canteen.
5	719	R. Shinkwin	Kennington	Flue Retort.
,,	720	R. Frost	Gray's Inn-road	Nursery Chaise Stand.
,,	721	T. R. Grimes and Co.	New Bond-street	Carriage Lamp.
6	722	R. Mabbs	Islington High-street	Milk Refrigerator.
8	723	J. Winter	Hackney	A Corbel for Walls.
10	724	T. Spratt	Kennington	Flexible Union Joint.
11	725	J. Hill	Piccadilly	Army Bucket.
12	726	Millward and Fiddian	Birmingham	Teapot.
13	727	R. S. Thorn	Basinghall-street	Book Rounder.
14	728	G. Hodges	Dublin	Swivel Bridge.
15	729	W. F. Taylor	Windsor	Music Book-stand.
19	730	B. Wilson	Bow-lane	Felt Banded Hat.
21	731	T. Wells	Ware, Herts	Gauge Guard.
,,	732	W. G. Gard	Tavistock	Ruler.

NOTICES TO CORRESPONDENTS.

We are compelled to postpone the publication of the letters of J. Ramsbottom, Cosmopolitus, and C. J. Recordon.

CONTENTS OF THIS NUMBER.

END OF VOL. LXIII. (921)

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